ARCHIVES OF OPHTHALMOLOGY.

ISOLATED PARALYSES OF THE OCULAR MUSCLES.

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PARALYSES of the ocular muscles are of great interest not only to the professed ophthalmologist, but also to the neurologist and general practitioner. Indicative in many cases of grave disease of the central nervous system, such as cerebral syphilis or tuberculosis, tabes, etc., they are then of marked diagnostic and prognostic significance. In other cases, they may be of comparatively innocent nature and be dependent upon transitory causes; and in still other cases, as when congenital or produced by traumatism (*e. g.*, by tenotomy), they may be entirely devoid of any ulterior pathological significance.

That type of paralysis in which but a single one of the ocular muscles is affected is particularly interesting, because it affords some clew to the yet unsolved problem of the precise situation and inter-connection of the separate nerve-nuclei scattered beneath the aqueduct of Sylvius and along the floor of the fourth ventricle, and, furthermore, because such paralysis, except when affecting the external rectus and superior oblique, is supposed to be unusual. It is, however, certainly more frequent than has hitherto been believed.

The following cases are reported either as showing the comparative frequency of paralyses hitherto regarded as rare, or because they exhibit the presence of peculiar features in paralyses of the more common type and illustrate the course that the latter tend to pursue.

A few words in regard to the *diagnosis* of ocular paralyses in general may not be amiss. This diagnosis, as is well

known, is based partly upon the characteristic restriction of the movements of the affected eye in some particular direction, partly upon the relation of the double images. In either case, it depends upon the fact that, in order to move the two eyes in any given direction, a special muscle or set of muscles is brought into play in each eye, which muscle or muscles[1] move their respective eyes at precisely the same rate, and which gradually cease to act as the eyes are carried in the reverse direction. Thus when we look up and to the right, our right eye is carried to the right by the external rectus, and up mainly by the superior rectus; and our left eye is carried to the right by the internal rectus, and up mainly by the inferior oblique. On the other hand, when we look up and to the left, our right eye is carried up mainly by the inferior oblique, and our left eye up mainly by the superior rectus. In both cases, the two eyes under normal conditions keep pace with each other very precisely, the superior rectus elevating one eye just as fast as the inferior oblique elevates the other, so that there is no deflection and hence no diplopia. If now, when the gaze is directed up and to the right, the right eye evidently lags below its fellow (and a diplopia indicating that the right eye is below begins to develop), the discrepancy must be due to an inequality in the muscles that elevate the two eyes, and in fact to a relative weakness of the right superior rectus. If the same discrepancy occurred when the eyes were directed up and to the left, it would indicate a relative weakness of the right inferior oblique. If again a discrepancy of the opposite sort (*i. e.*, a lagging of the left eye below the right) develops as the eyes are carried up, it means weakness of one of the left

[1] It is quite certain that for the production of even the simplest movements of the eye more than one muscle is necessary. Thus when the eye is moved straight outwards there is a contraction not only of the external rectus, but also of the superior and inferior recti and of the superior and inferior obliques. These muscles by their counter-traction tend to keep the eye steady in its path, and in the case of the obliques also reinforce the action of the external rectus (the more so, the more the eye is moved outwards). The proof of this is that if one of these auxiliary muscles (*e. g.*, the superior rectus) is paralyzed or acts spasmodically, it will cause even in the course of movements in a horizontal line a marked deflection up or down. For extended remarks upon this point, with tables and diagram showing the part taken by each muscle in the associated movements of the eyes, see the author's *Motor Anomalies of the Eyes*, J. H. Vail & Co., New York, 1897, pp. 9–19 and 26–29.

elevators, and in fact of the left superior rectus or the left inferior oblique, according as the discrepancy is most pronounced in the left-hand or in the right-hand upper field.

The discrepancy may be great or small. If small, it will produce a diplopia of small amount, and one which begins to develop only when the eyes have been carried nearly to the limits of their excursion and which increases slowly. Such diplopia may be physiological, being due to simple tiring of the eyes or to slight normal inequalities in the movements of the two. But a great discrepancy, producing a diplopia which begins to develop when the eyes are in the primary position or are removed not more than 25° from it, which increases rapidly, and which soon becomes absolutely great in amount, can only be due to pathological weakness or over-action of one or more of the ocular muscles.[1] And if the diplopia is very great and increases very rapidly, it must be held to indicate paresis (or spasm[2]), as no other conditions can produce such a very marked inequality in the movements of two organs which ordinarily keep pace with each other up to the farthest limits of their excursion.

While in all pronounced cases of ocular paralysis the lagging of the affected eye behind the other in the performance of associated movements is easy to recognize, the most satisfactory and certain evidence of the trouble is obtained from the *double images*. For determining these, the following method probably gives the most accurate results. The patient is placed (preferably in a dark room) with his head fixed and with his eyes in the primary position, *i. e.*, with both directed straight ahead and on a level, and a red glass is placed before one eye. A lighted candle, which, in order

[1] A diplopia which occurs uniformly when the eyes have been carried not more than 40° from the primary position in any one direction cannot be regarded as physiological (*l. c.*, p. 35). See, for a more extended discussion of this subject, the author's article, "Diplopia in the Periphery of the Field of Fixation and its Bearing on the Diagnosis of Muscular Paralysis," in the ARCHIVES OF OPHTHALMOLOGY, xxiv., 4 (1895).

[2] Paresis and spasm are here taken in their widest sense, as meaning underaction and over-action due to anomalies of the muscles themselves as well as of their nerve supply. Paresis and spasm may be classed as structural, insertional, or innervational, according as the structure of the muscle, the insertion of its tendon, or the nerve and nerve-nucleus supplying the muscle are at fault; and it is to be noted that the symptoms presented by these three classes of anomalies are not *essentially* different.

to avoid the disturbing effects of projection, should be not less than three or four feet from the patient, is carried successively to the right, left, up, down, and obliquely, and the patient is asked whether he sees two images of the flame, what is their color, how they are placed with regard to each other, how far they are apart, and whether the distance between them increases or diminishes as the candle is carried in each direction. If he sees one flame, and that parti-colored (yellow with a pinkish border), he has binocular single vision. If he sees one flame, which, however, is either pure red or pure yellow, he probably has double vision, but ignores one of the images (monocular vision). If he sees two flames, one red and the other yellow, he has diplopia, the nature of which is indicated by the relative position of the red and the yellow flames. Thus, when the red glass is placed before the right eye, the red flame may be:

To the right of the yellow flame (*Homonymous Diplopia*), indicating convergence of the visual axes.

To the left of the yellow flame (*Crossed Diplopia*), indicating divergence of the visual axes.

Above the yellow flame (*Left Diplopia*[1]), indicating vertical divergence of the visual axes, with the axis of the left eye higher (left hyperphoria).

Below the yellow flame (*Right Diplopia*[1]), indicating vertical divergence of the visual axes, with the axis of the right eye higher (right hyperphoria).

The distance between the double images may vary from four or five inches (representing an angular deviation of 5°, or the deviation produced by a 10° prism) to several feet.

[1] The terms Right and Left Diplopia (DR and DL) were devised by the author ("Some New Tests for Insufficiences," *N. Y. Med. Journ.*, Aug. 3, 1889) to avoid the cumbrous periphrasis "vertical diplopia with the image of the right eye below" (or "above"). They correspond, as will be seen, to the conditions of right and left hyperphoria, and, like the latter terms, convey no implication (any more than do the terms homonymous and crossed diplopia) as to the *eye* which is at fault. *E. g.*, right diplopia, like right hyperphoria, may signify either that the right eye is too high or that the right eye is normally placed and that the left eye is too low; just as homonymous diplopia in itself simply means that one of the two eyes converges unduly, but does not show which one does so.

PARALYSIS OF THE EXTERNUS.

CASE 1.—**Paresis of Left Externus Following Diphtheria.**

Boy, five or six years of age, seen in the Vanderbilt Clinic, March, 1895. Diphtheria five weeks before, with loss of reflexes, various pareses, and interference with phonation.

Movement of left eye outwards markedly restricted. No other impairment of movements of eyes. Left pupil reacts to light. Accommodation not tested.

Right eye, chalky cataract. No reaction of pupil, either direct or consensual.

CASE 2.—**Paresis of Both Externi Following Diphtheria; Secondary Contraction of Interni.**

Maggie C., aged six. Seen at the Vanderbilt Clinic, March 28, 1895. Had diphtheria four years ago, followed apparently by various paralyses. Present condition of eyes developed soon after the attack.

For straightforward directions of the gaze, slight convergent strabismus; particularly noticeable on alternate covering (screen test). Behind the screen, left eye deviates inwards more markedly than does the right. Left eye moves outward scarcely at all beyond middle line; outward movement of right eye limited to one-half the normal. When eyes are directed up, the eye not used for fixation tends to deviate strongly inwards.

Post-diphtheritic paralysis of the exterior muscles of the eye is usually regarded as rather rare, the ordinary ocular lesion following diphtheria being a paralysis of accommodation without involvement either of the extra-ocular muscles or of the sphincter iridis. Uhthoff, Mendel, and Rosenmeyer, however, have observed four cases of paralysis of the externus with or without involvement of the other muscles and the accommodation, and Remak, out of one hundred cases of post-diphtheritic paralyses of the ocular muscles, found ten of unilateral or bilateral paresis of the externus. I myself have seen at least two other cases of the sort, and also one of paretic *outward* deviation following diphtheria.

It is to be noted that, in many instances at least, the paralysis of the exterior ocular muscles produced by diph-

theria, instead of being temporary as is usually the case with such post-diphtheritic lesions, persists, and, as in Case 2, is followed by more or less contracture of the antagonists. The cause of the paralysis, according to Mauthner, is a lesion, probably consisting of capillary hemorrhages, of the nerve-nuclei. But why, if this explanation is the correct one, the external rectus should be so predominantly affected, and why, moreover, the muscles of both sides are so comparatively often involved, does not seem clear.

In paralysis of the externus, not only is there restriction of movements outward, but, in movements up and out and down and out, the vertical meridian of the cornea of the paretic eye undergoes less rotation than does that of the sound eye. This follows from the way in which the superior and inferior recti and obliques act upon the eye in the different oblique positions of the gaze. The result, theoretically at least, is that, when the eyes are directed obliquely up or obliquely down, the *double images are tilted* with regard to each other, and there is, moreover, a vertical as well as an homonymous diplopia. Such diplopia, however, requires very accurate observation on the part of the patient for its recognition, and hence is very rarely observed. In one case which I saw, and in which a vertical diplopia already existed, the diplopia increased and decreased exactly as it should do according to the theory; but in no other instance that I recollect have I been able to verify the existence of vertical diplopia of this sort, and in no instance at all have I been able to make out with certainty that there was any tilting of the double images.

PARALYSIS OF THE SUPERIOR OBLIQUE.

Case 3.—Bilateral Paralysis of the Superior Oblique.

D. B., Italian, male, aged thirty-four, seen at Ophthalmic and Aural Institute, March 19, 1894. Severe attack of rheumatism, affecting arms, legs, and body generally, six months ago. Diplopia developed suddenly at that time and has persisted ever since. Present only when he looks down, and associated with vertigo; also with confusion when he goes down-stairs. No headache.

Homonymous diplopia in the whole lower field of fixation. When he looks downward in the middle line, images are on a level; as he looks down and to the right, a marked vertical diplopia develops with the image of the left eye below, and as he looks downwards and to the left, a (somewhat less marked) vertical diplopia with the image of the right eye below. Tilting of the double images both in looking down and to the right and down and to the left, the image of the right eye being tipped to the left.

Subsequent examinations made in the course of the next two weeks gave precisely the same finding.

Bilateral paralysis of the superior oblique is certainly very rare. Mooren, in 108,416 cases of eye disease, had not seen a single case of the kind. Mauthner, whose acquaintance with the literature of the subject was doubtless great, appears to have heard of but one case (that of Remak, reported in 1887), and remarks that if such occurred both the objective signs and the subjective symptoms must be insignificant. That they are not so, is evident enough from the case cited above.

The symptoms, in fact, are as pronounced, and the diagnosis is as easy as in a case of unilateral paralysis. What the signs of such a condition must be, is evident from the following considerations.

A more or less equal paralysis of both superior obliques will produce a restriction in the movement of each eye downwards. When both eyes are directed *downwards and forwards*, this restriction will be equal for the two, so that the eyes, although neither moves perfectly downwards, will remain on the same level. Hence there will be no vertical diplopia in this position of the gaze. On the other hand, when the eyes are directed *down and to the right*, a position in which the depressing action of the left superior oblique comes very strongly into play, while that of the right superior oblique is little or nothing, the restriction in the downward movement of the right eye will be slight and decreasing and that of the left eye will be marked and increasing, so that the left eye will come to stand more and more above the right; hence, as the gaze is carried in this direction, we shall find a vertical diplopia indicative of a progressively in-

creasing left hyperphoria, *i. e.*, a vertical diplopia with the image of the left eye below that of the right (*left diplopia*) and falling more and more below, the farther the eyes are carried to the right. Similarly, when the eyes are carried *down and to the left*, we shall find a progressively increasing vertical diplopia with the image of the right eye going below (*i. e.*, a rapidly increasing *right diplopia*). Again, *for all downward directions* of the gaze there will be *homonymous diplopia*, because, owing to the abolition of the abducent action of its superior oblique, each eye tends to converge abnormally. This homonymous diplopia, which is marked in paralysis of one superior oblique, will be still more so in bilateral paralysis. The same is true of the tilting of the double images, which will be more pronounced in bilateral than in unilateral paralysis, since, owing to the abolition of the inward rotating action of both superior obliques, the vertical meridian of both eyes will tend to diverge. This divergence of the meridians produces convergent tipping of the double images (*convergent rotation diplopia*). In paralysis of the right superior oblique, this tilting of the images will be most pronounced when the patient looks down and to the right; in paralysis of the left superior oblique, most pronounced when he looks down and to the left. In bilateral paralysis, it will be marked and equally so in both positions, of the gaze. Lastly, in the upper half of the field of fixation, in which the superior obliques normally exert no action, there will be no deviation and no diplopia.

Hence, if in a simultaneous paralysis of both superior obliques a red glass is placed before the right eye, there will be single vision above the horizontal plane, and double vision everywhere below, with the red image on the right of the white and with the red image tilted to the left. When the eyes are directed downwards and forwards, the red and white images are on a level; as the eyes are directed down and to the right, the white image falls rapidly below the red; and as the eyes are directed down and to the left, the red image falls rapidly below the white.

These are the typical features of a simultaneous paralysis of both superior obliques, and, as will be seen, these were

precisely the features met with in the case detailed above. Moreover, no other pathological condition produces just these symptoms.[1] Hence there is no doubt of the diagnosis in this case, particularly as the findings were substantiated by repeated examinations made at different times.

The following case shows how the subsequent course of a paralysis of the superior oblique is complicated by the development of secondary contractures and by spasmodic action of the opponents of the paralyzed muscle.

CASE 4.—**Paralysis of Left Superior Oblique with Consecutive Spasm of Left Inferior Oblique; Central Choroiditis.**

Jane W., aged sixty-five, came to my office, Aug. 20, 1895. Sight poor for last three or four years. For four or five years confusion of sight, particularly marked if she goes down-stairs, when she has to shut her right eye to avoid making a misstep. Cannot tell when she gets to the last step. No vertigo, diplopia, nor headache.

R: $\frac{20}{40}$ −; + 1.00 cyl. ax. 10° t., $\frac{20}{20}$ +. L: $\frac{20}{70}$ −; − 0.50 + 1.00 cyl. ax. 20° t., $\frac{20}{40}$ −. Peripheral field normal. Media clear. In region of yellow spot, faint light patches of irregular shape, lying beneath retinal vessels.

In primary position, left hyperphoria and vertical (left) diplopia of many degrees. Behind screen, left eye stands markedly higher. In performing downward movements, the left eye lags markedly behind the right, and this restriction of movement is more pronounced when the eyes are carried down and to the right than when they are carried down and to the left. The vertical (left) diplopia also increases greatly as the eyes are directed down and very greatly when they are directed down and to the right. (In the latter position the vertical distance between the two images of a candle held three and a half feet from the patient was a foot and a half.) As the eyes are carried up, the vertical diplopia diminishes, and when the gaze is directed up and to the left disappears altogether; vertical (left) diplopia, on

[1] Paralysis of the left superior oblique with spasm of the left inferior rectus would, it is true, produce nearly the same symptoms. But in the cases that I have seen in which there was evident spasm, the deviation and diplopia from the nature of things did not remain constant, but showed abrupt and irregular changes in character and amount from one time of examination to the other. In the case under consideration, the constancy of the conditions and the absence of any evidences of spasmodic, excessive movement precluded the idea of a spastic deviation.

the contrary, marked when the gaze is directed up and to the right. No tilting of the double images.[1]

September 4th.—Conditions same, except that vertical (left) diplopia is also marked for directions of the gaze down and to the left and up and to the left. When the eyes are carried up and to the right, the right eye seems to lag below. When the eyes are carried to the right on a horizontal line, *left eye flies obliquely up.*

Here the original condition was doubtless a paralysis of the left superior oblique. This would have produced a vertical (left) diplopia, present only in the lower field and increasing markedly as the eyes were carried down and to the right. Later, contracture of the left elevator muscles (particularly the left inferior oblique) set in, producing elevation of the left eye above the right and a vertical (left) diplopia extending to the upper and especially to the right and upper portions of the field of fixation. At times also the effects of this steady contracture, which by itself would produce a more or less constant diplopia, were exaggerated by the development of an irregular spasmodic contraction of the same muscles, the net result of which was to transform into an almost concomitant deviation one which was at first markedly non-concomitant. This sort of transformation I have repeatedly observed, and in another place have commented upon it at length.[2]

It is to be noted that in the case described the evidences of *spasm of the inferior oblique* were particularly marked. No other condition could have produced the pronounced upward movement of the left eye, developing when the attempt was made to carry the eye inward along a horizontal line and increasing in proportion as the eye was carried to the right.

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[1] It may be pointed out how much more clearly and concisely these conditions are set forth by the use of the abbreviations and symbols recommended by the author (*N. Y. Medical Journ.*, Aug. 3, 1889; ARCH. OF OPHTH., April, 1894). The above record for August 20th would then read as follows:

DL many degrees. L H (Phorometer, many degrees; Screen, marked). Ed, L. eye lags very greatly (in Ed. and r > Ed and l). Ed, D L > > and in Ed and r > > > (at 3½ ft. = 1½ ft. vertical distance). In Eu, D L < <, but in Eu and r still marked. Eu and l, DX. No tilting of double images.

[2] *Motor Anomalies of the Eye*, pp. 48, 53, 54, 57.

PARALYSIS OF THE SUPERIOR RECTUS.

In the ARCHIVES OF OPHTHALMOLOGY for April, 1894, I reported a number of cases of paresis, simple or complicated, of the superior rectus. Some of these cases I had the opportunity of re-examining later, and out of ten in which the data were sufficient to leave no doubt as to the conditions present, the original diagnosis was confirmed in eight (ARCHIVES OF OPHTH., xxiv., 4, 1895). Subsequently Bernstein reported three cases before the American Medical Association (See *Journ. Amer. Med. Assoc.*, Nov. 9, 1895); and I myself have seen no less than fourteen others in which the evidences of a complete or well-marked paralysis were indubitably present. The following will serve as an example of the cases in which the paralysis was incomplete.

CASE 5.—**Paresis of Right Superior Rectus; Insufficiency of the Interni.**

Miss J. D., aged about twenty-five, came to my office, January 15, 1896. Sight has always been poor, and for about one year right eye has tended to diverge.

R: $\frac{10}{200}$; $-$ 4.00 $\frac{20}{40}$ +. L: $\frac{20}{100}$; $-$ 2.00 $-$ 2.00 cyl. ax. 75° n, $\frac{20}{40}$. Interior normal.

In primary position, fixes more readily with right than with left eye for ordinary distances, but at very near points fixes with left eye, and right diverges. At her reading distance (5″), alternate monocular fixation. Sometimes when she fixes with right eye, left flies far up (secondary contraction).

In primary position, crossed and slight vertical (left) diplopia; and by screen-test, divergence both for distance and near and left hyperphoria. Inward movements of both eyes limited, outward movements excessive. When she looks up, the right eye lags below, this vertical deviation increasing greatly when she looks up and to the right, while when she looks up and to the left only a lateral deflection (divergence) can be made out. The vertical (left) diplopia, too, increases greatly as the gaze is directed up and to the right (several examinations); elsewhere diminishing or absent. Frequently loses one of the double images, especially that of the left eye.

Here we have an almost typical picture of paralysis of the right superior rectus. The features that we should expect

to find in such a case are as follows: Below the horizontal plane, single vision and absence of deflection; at and above it, lagging of the right eye below the left, and divergence (due to the abolition of the adducent action of the superior rectus). This deflection, both vertical and divergent, and hence also the diplopia (crossed and vertical) will increase as the eyes are carried up. The vertical deflection and diplopia (left diplopia) increases rapidly as the eyes are carried up and to the right (a position in which elevation of the right eye is performed mainly by its superior rectus), and diminishes to zero as the eyes are carried up and to the left (a position in which elevation of the right eye is performed mainly by the inferior oblique). On the other hand, the lateral deviation (and the crossed diplopia) will be little or nothing in the up- and -right position of the gaze (where the right superior rectus exerts no lateral action), and will be most marked when the eyes are directed up and to the left, a position in which the chief action of the right superior rectus is to adduct the eye, and in which, therefore, paralysis of the muscle will produce the greatest effects in causing a lateral deflection.

These features were pronounced in the case above recorded.

One peculiar feature of this and of some other cases of paresis is the tendency displayed to *perform fixation with the paretic eye*, which in this case, moreover, was the more amblyopic of the two. The explanation for this phenomenon may be that when the paretic eye fixes, there is, as is well known (and as was well seen in the present case), a marked secondary deviation of the unaffected eye, the deflection being therefore greater when the paretic eye fixes than when the sound eye fixes. Now it frequently happens that when an insuperable deviation exists, it is the less troublesome to the patient the greater it is; for, the wider apart the double images are, the more readily can the false image be ignored. Hence, it is rather an advantage for the patient to fix with his paretic eye, unless the paresis is so great as to require him to make an excessive effort in order to do so.

The *tilting of the double images*, that should theoretically exist in all cases, was not noticed in this. Although

Mauthner says that practically it does not occur at all, it was present in five of the cases that I previously reported and in two of those that I have examined since (including one of total, congenital paralysis).

The *insufficiency of adduction* here observed, is a common feature of these cases. In my former paper I had already noted the presence of an exophoria, which is usually unassociated with an increase of abducting power and which itself tends to gradually increase. This exophoria, in fact, seems to be the cause of most of the symptoms, and occurs so frequently as to leave no doubt that the paralysis of the superior rectus stands in causal relation to it. Such a paralysis necessarily entails a slight restriction of the inward movements of the eye, a restriction particularly marked when the eye is near the limits of its inward excursion, and leads, as I have had occasion in several cases to observe, to a progressive limitation of convergence quite out of proportion to the limitation in lateral movements; *i. e.*, produces a true *convergence-insufficiency* [1] in addition to the original insufficiency of associated adduction. The moderate divergence thus set up may, as I have also had occasion to observe, increase until an actual strabismus divergens is developed.

The *frequency* of these cases of paralysis of the superior rectus is quite surprising. *A priori*, there seems no reason why one of the four muscles supplied by the third nerve should be paralyzed oftener than another. Yet the extreme rarity of paralysis of the inferior oblique has long been recognized, and the comparative frequency of paralysis of the superior rectus can, it seems to me, scarcely be gainsaid. Thus I have seen twenty-two well marked cases. To be sure, five of these were traumatic, *i. e.*, produced by complete tenotomy of the superior rectus, and these cases should properly be excluded in estimating the real frequency of the affection. Of the remaining cases I am inclined to think that the majority are attributable to intra-orbital causes (non-development or

[1] *I. e.*, a condition associated with slight exophoria for distance, no special increase in the diverging power (power of overcoming prisms base in), marked exophoria for near, recession of the convergence near-point (to five or more inches), and real limitation of the prism-convergence (power of overcoming prisms base out).

faulty insertion of the muscle itself) rather than to a lesion of the nucleus. Many of the congenital cases, certainly, are due to non-development of the superior rectus (Mauthner, Fuchs); and it is likely that most of the cases observed in the young, and which show no tendency to change from one time to another, are really congenital. Such cases are comparatively frequent. And of the cases seen in older persons, few present either the causes or the symptoms usually ascribed to nuclear paralyses.

If the paralysis is regarded as nuclear, it would indicate that the nucleus of the superior rectus is somewhat remote from the other partial nuclei constituting the oculomotor group.

According to most observers, paralysis of the superior rectus occurs much *less frequently* than I have found. Thus in 188,000 ophthalmic cases of all sorts recorded by four different authors, this condition was observed in but 20 (Mauthner). But this matter of statistics is one into which the personal equation enters very largely, and, as the condition under consideration is not one that is obvious at first glance, but is revealed only by careful examination, it is natural that a man who directs his attention to the study of muscular anomalies should see more cases relatively than another does whose attention is otherwise engaged. This fact is strikingly brought out by an analysis of the above statistics. Mooren, who records 108,000 cases of eye-disease, did not observe a single instance of paralysis of the superior rectus, while A. Graefe with 40,000 cases saw 9, and another observer with 20,000 cases saw 8 of this anomaly. The reason for this discrepancy lies, perhaps, partly in a real difference in the cases, but mainly, no doubt, in the fact that some of the observers examine less thoroughly than others for muscular anomalies and hence overlook the less obvious ones. In support of this view it is to be noted that this condition is not often associated with any very marked symptoms which call attention to its presence. It causes, for example, nothing like the characteristic disturbances that paralysis of a depressor muscle (either superior oblique or inferior rectus) occasions. For, while in the ordinary affairs

of life we often have to look down, we rarely need to look up, and hence a diplopia which occurs only when we look up may readily be disregarded or even overlooked altogether. Accordingly, many of the patients make little complaint, do not allege the existence of diplopia, and come in most cases for the correction of some trouble quite independent of their muscular anomaly. The surgeon corrects the trouble that the patient comes for, without usually making any very searching ulterior examination, and naturally overlooks that to which his attention has in no way been called.

That this is the true explanation of the discrepancies above noted I am persuaded from seeing how readily the condition might, even when well marked, have been overlooked in the cases that I myself observed, had not the muscles been examined as a matter of routine in all.

PARALYSIS OF THE INFERIOR RECTUS.

Paralysis of the inferior rectus causes the patient much more disturbance than does that of the superior rectus. It occasions, in fact, much the same symptoms as paralysis of the superior oblique, namely, diplopia, false projection, and vertigo, increasing rapidly as the eyes are directed downwards. Reading, writing, walking, and going down-stairs[1] cause pain, a sense of uncertainty and confusion, and vertigo; and even in the very slight cases I have noticed that pain and vertigo were produced when the patient tried to look far down. On account of this marked character of the symptoms, this form of paralysis is probably much less often overlooked than is paralysis of the superior rectus, and hence its relative frequency has very likely been exaggerated. In the series of 188,000 cases already mentioned, it is noted as occurring in 26 (a proportion of 1:7,000), while if we take the statistics of A. Graefe, which are much more likely to be accurate on this point, we find a proportion of 10 out of 40,000 or 1:4000. Schubert and Schöler's figures taken together give the same proportion. Graefe,

[1] Theoretically at least. Nevertheless, those patients whom I have questioned did not seem to have much trouble in going down-stairs, and the most disturbing symptoms seemed to be the blurring of sight, confusion, and asthenopia dolens produced by the use of the eyes for reading, writing, and drawing.

Schubert, and Schöler found almost precisely the same number of cases of paralysis of the superior and of the inferior rectus, but from the considerations already advanced it would seem that this apparent equality is not real. In my own experience, I have observed 11 cases of paralysis of the inferior rectus, 3 of which, however, were of comparatively slight intensity, while one of the others was traumatic in origin. So that, as against 17 well-marked cases of non-traumatic paralysis of the superior rectus there were but 7 in which the inferior rectus was involved to a like extent.

The following case, which I have already elsewhere reported,[1] illustrates the chief features of such a paralysis, and also the development of secondary spasm in a case of long standing.

Paresis of Right Inferior Rectus. Varying Spasm of Right Superior Rectus.

H., male, aged twenty-nine, came to the Ophthalmic and Aural Institute, February 10, 1896. For two years vertigo and blurring of sight for near, especially for his work (fine mechanical drawing). Diplopia spontaneous, but superable. No trouble in going down-stairs.

R $\frac{20}{10}$ +; − 0.50 − 0.50 cyl. ax. vert. $\frac{20}{30}$ −. L $\frac{20}{200}$; + 2.00 cyl. ax. 10° n. $\frac{20}{10}$+. Fixes mainly with right eye.

Behind the screen, both for distance and near, the covered eye diverges for all directions of the gaze. When the eyes are directed straight ahead, the right eye moves up and the left eye moves down, when screened. This vertical movement becomes marked when the eyes are directed down, and extremely marked when they are directed down and to the right, but is little marked or absent when the eyes are directed down and to the left or are directed up.

With a test-object held at 3 feet, moderate crossed and right diplopia (vertical diplopia with the image of the right eye below). Right diplopia increasing as the eyes are carried down, and markedly so as the eyes are carried down and to the right (here = 6° deviation = diplopia produced by a 12° prism). Right diplopia diminishing to zero, and crossed diplopia increasing when the eyes are directed down and to the left. Right diplopia also diminishing to zero when the eyes are carried far up.

[1] *Motor Anomalies of the Eye*, p. 53.

Feb. 19th.—Vertigo more marked. Sense of strain in the eyes when he tries to move them. Is conscious that the right eye does not move downward as it should. Vertical (right) diplopia greater and now present more or less in all parts of the field of fixation, although still very much the most pronounced when the eyes are directed down and to the right (here now = 11° deviation = diplopia produced by a prism of 20°). Quite marked when he looks up and to the right, but here varying in amount. No tilting of the double images. Convergence near-point 5″, but sometimes not nearer than 7″ or 8″.

March 13th.—Findings essentially the same, except that there is now no vertical diplopia when the gaze is directed up in the middle line or up and to the left. Vertical (right) diplopia still when he looks up and to the right.

The patient at the date of the first observation showed a typical picture of paralysis of the right inferior rectus with evidently some contracture of the elevators (shown by the fact that the vertical diplopia still persisted even when the gaze was directed quite high up).

At the second visit it was evident that superadded to the original condition there was a more or less pronounced spastic contraction of the right elevators, particularly the superior rectus, causing a marked elevation of the right eye for all upward directions of the gaze, but most marked when the eyes were directed up and to the right. The variable character of this superadded deviation, and the fact that it had more or less passed off at the time of the third visit, showed that it was due to spasm and not to paralysis.

In this case, as in Case 5, *fixation was performed habitually by the paretic eye.*

The tendency to *divergence* and to the secondary development of a convergence-insufficiency, so marked in cases of paralysis of the superior rectus, was present also and doubtless for the same reason in this case and in some others of paralysis of the inferior rectus which I saw. But, owing to the natural tendency of the eyes to converge when directed down, this pathological divergence is much less marked than it is in paralysis of the superior rectus, and, in fact, is in some cases replaced by an esophoria, so that with the charac-

teristic vertical diplopia we find homonymous instead of crossed double images. This, however, need cause no confusion in the diagnosis, since the latter can be made from the vertical diplopia alone. *E. g.*, a pronounced right diplopia (vertical diplopia with the image formed by the right eye below), which is present only in the lower field and which increases markedly as the eyes are directed down and to the right, and diminishes to zero as the eyes are directed down and to the left, can mean nothing else than paralysis of the right inferior rectus; and whether the image of the right eye is on the left or the right of the other image is not of material importance for the determination of the question.

SCOPOLAMINE HYDROBROMATE AS A CYCLOPLEGIC.

By T. E. MURRELL, M.D., Denver, Col.

I BEGAN the use of this agent for determining refraction two years ago, and I have used it exclusively since. Owing to ill-health and interrupted practice I have not had the opportunity to use it on so large a scale as I could otherwise have done, but I have records of fully two hundred cases in which I have determined the refraction under scopolamine.

I made my first report on its effects in the *Annals of Ophthalmology and Otology*, vol. iv., No. 4, October, 1895. At that time I had used it in fifty-seven cases. To this number I can now add about one hundred and fifty more cases.

Strength of Solution.—Scopolamine is about ten times as powerful and ten times as toxic as atropine. Its systemic effects in poisonous doses are similar to those of atropine with a greater tendency to wild and boisterous delirium. Dr. Hobbs of Atlanta, to whose experiments with this drug we owe much of our knowledge, was thrown into furious delirium by one-half of one per cent. solution, one drop in each eye. He cautions particularly against the use of strong solutions. There have been published within the last year several reports of systemic poisoning by the instillation of a solution of scopolamine in the eyes, and in every instance it was used to excess. In one case a lady was given a *one-per-cent. solution*, and told to drop one or two drops in each eye three times daily. The result was, the first drops poisoned her frightfully. In another case reported, a half of one per

cent. solution was used repeatedly with poisonous effects. In a third report one-fourth of one per cent. solution was dropped, one drop at a time, in each eye every few minutes until instilled eight or ten times. Of course poisoning occurred. The one-tenth of one per cent. solution is fully as strong in its mydriatic and cycloplegic effects as a one-per-cent. solution of atropine, and far more positive than a single instillation of atropine. I have never used a stronger solution than one-tenth of one per cent., of which I habitually instil two small drops, about one minim, in each eye about ten minutes apart. At the end of one hour from the first instillation I have found the eyes ready for the refraction test. It is probable a single drop in place of two would answer every purpose, since it is the most positive and the speediest cycloplegic within my knowledge. Dr. Hobbs claims equally positive results with one-twentieth of one per cent. solution. For dilating the pupil, therefore, as in iritis, or for paralyzing the accommodation, there is no necessity for using a stronger solution than the one-tenth per cent., which is void of toxicity unless too frequently and too freely used and allowed to flow into the nasal duct, which is altogether unnecessary and avoidable. It should be dropped in a single drop from a small-tipped pipette on the upper margin of the cornea, while the upper lid is retracted, and allowed to flow over the cornea. We thus get all the eye will take up without an excess to flow into the lachrymal passages. A second or third instillation ten minutes apart causes no constitutional symptoms whatever, but applied ten or twelve times without regard to entering the punctum even the one-tenth per cent. solution will cause toxic symptoms. There is no necessity, however, for more than one repetition of the drop at a short interval to produce the most powerful mydriatic and cycloplegic effect.

Action.—The absorption and effect of scopolamine on the iris and ciliary muscle are very speedy. In ten minutes the pupil begins to dilate, and almost at the same time the accommodation is affected. In fifteen minutes the pupil is widely dilated and the patient is unable to read small print. Paralysis of the accommodation comes on rapidly, and it is

totally suspended inside of an hour, often in thirty minutes, but my rule is to allow a full hour from the first instillation to time of beginning the refraction test to be sure of total suspension of the accommodation. The total suspension of accommodation lasts some hours. I have tested the refraction twelve hours after the instillation with perfect satisfaction, though I have found evidence in some cases of a slight accommodation after six hours. In twenty-four hours the cycloplegia begins to decline, and at the end of forty-eight hours has wellnigh passed away, while in seventy-two hours it has generally totally disappeared. The mydriasis usually persists slightly longer. In point of time of inception and termination of cycloplegia, scopolamine in the one-tenth per cent. solution is the most uniform of any agent I have ever used. Prior to using it I relied on homatropine for determining refraction, but met with occasional instances in which it failed after numerous and long-continued instillations of a two-per-cent. solution to totally suspend the accommodation. In about two hundred successive cases scopolamine has not once failed me.

Advantages. — Atropine is objectionable for refraction work, because of the time required to fully suspend the accommodation, and because of the long persistence of its effect on the pupil and ciliary muscle. Furthermore, when the age of presbyopia is approaching, it is not altogether free from the danger of exciting a tendency to glaucoma. The fault with homatropine is threefold: 1st. It is not absolutely positive in its cycloplegic effects, and may lead to erroneous results. 2d. It often very greatly congests the eye, followed, in some instances, by a dull, heavy aching that persists several hours. 3d. It demands a great deal of time and attention on the part of the surgeon in using, one surgeon (Savage) instilling a drop every ten minutes for an hour, another (Reynolds) every minute for ten minutes, others a drop every five minutes five or six times.

Scopolamine requires only the second instillation after ten or fifteen minutes, and if the surgeon should be busy and not get ready for the examination for two or three or even six hours, he will find the eyes in the right condi-

tion; whereas with homatropine the examination must be made promptly within a short time after its full effects. From scopolamine in the strength herein recommended there is no increase of tension, no reddening of the eye, but rather a blanching than otherwise, the sclera appearing unusually white; nor is there the slighest sense of discomfort of any sort further than that produced by the annoyance of excess of light and confusion of vision. A weak solution of eserine, one-fourth grain to the ounce, used a few times at intervals of six hours will effectually restore the accommodation. I used scopolamine on two busy physicians last summer, and by the use of eserine afterwards they had no trouble in reading, writing prescriptions, and attending to their practice.

The Solution.—My solutions have been put up with boric acid, ten grains to the ounce, but a simple solution might answer as well. Evidently scopolamine is germicidal, or fungicidal, since no spores or evidences of deterioration have ever appeared in any solution after a year or more. Nor does it seem in the least to lose its properties however long kept, the last of a solution more than a year old being as potent as when first prepared.

Summary.—1st. Scopolamine hydrobromate is the most positive and prompt cycloplegic we have.

2d. It should not be used in a stronger solution than the one-tenth of one per cent.

3d. Two instillations at most are all-sufficient for the most thorough suspension of the accommodation.

4th. It is free, in this strength, from the danger of increased tension, and causes no redness of the conjunctiva nor engorgement of the choroid, and no unpleasant symptoms other than those due to its physiological action.

5th. It is convenient to use, reliable in its results, safe, keeps well, and possesses fewer objections than any other known cycloplegic.

After twenty years' experience in the use of agents to control the accommodation for determining errors of refraction, two years' use of scopolamine hydrobromate in some two hundred cases has satisfied me, personally, that it is the best

agent for this purpose that has thus far been given us by materia medica.

Just as I am finishing this paper a young lady comes in to be refracted. One drop of one-tenth per cent. solution of scopolamine hydrobromate was instilled into each eye. In ten minutes, pupils were dilating. In fifteen minutes, they were widely dilated, and she could not read Sn. 2. D. Another drop was now put in each eye. In thirty minutes I began testing the right eye. In five more minutes I had the following formula: + 1. S ⌒ − 3. 50 C 175° V = $\frac{1}{20}$. The left eye was then tested, with this result: + 2. S ⌒ − 4. C 10° V = $\frac{1}{20}$. At the end of an hour the test was repeated on both eyes, and no modification of the above glasses improved vision.

AN OPERATION FOR TRICHIASIS DUE TO CICATRICIAL ENTROPION.[1]

By W. ODILLO MAHER, M.D.,

HONORARY OPHTHALMIC SURGEON TO THE SYDNEY HOSPITAL AND ST. VINCENT'S HOSPITAL, SYDNEY, N.S.WALES.

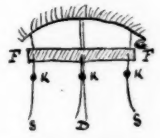
AN operation I have found give the most satisfactory results in cases of trichiasis and districhiasis, due to cicatricial entropion, consists in thoroughly dividing the tarsal cartilage from the under surface of the lid from end to end at about two and a half millimetres from its free edge, as in a Burow, and fixing with sutures between the edges of the divided cartilage a piece of mucous membrane the length of the tarsal cartilage and about two or three millimetres broad.

I perform the operation in the following manner:

Standing behind the patient, who is anæsthetized, I evert the lid, and make a puncture with a Beers knife through the tarsal cartilage, at the outer canthus if operating on the right lid, and at the inner canthus if operating on the left, and divide the cartilage and all structures of the lid to the skin from end to end, parallel with and about two and a half millimetres from its free edge, with a straight, blunt-pointed scissors, by passing one blade through the puncture, and subcutaneously along the length of the cartilage. The lower lip is now clamped with a Snellen entropion clamp to prevent hemorrhage, and a flap of mucous membrane the length of the incision in the cartilage, and from two to three millimetres broad, is marked out by two parallel cuts with

[1] A paper read before a meeting of the N. S. Wales branch of the British Medical Association, at which cases were shown.

a Beers knife, and removed by a few snips of a scissors. The mucous-membrane flap is then laid on the tip of the forefinger of the left hand, and any submucous tissue snipped off with scissors. Three silk sutures, two single and one double, with knots about two centimetres from the ends, are used. The single sutures are passed through the ends of the flap from its mucous surface, and then through the ends of the cut in the cartilage, coming out on the cutaneous surface of the lid near the canthi and a few millimetres from its free edge. The double suture is now passed through the middle of the flap from its mucous surface and through the middle of the cut in the cartilage, coming out on the cutaneous surface of the lid midway between the canthi and a few millimetres from its free edge. By drawing on these sutures, the knots pull the flap of mucous membrane well in between the cut edges of the cartilage. An assistant now applies with his finger a little traction on the skin of the lid, so as to cause the edge of the lid to evert and the wound in the cartilage to gape. The sutures are then tied. Either the two single or end sutures are tied together across the lid parallel with its free edge, and between the two threads of the double suture, which are tied over them, or the single end sutures may each be tied to a thread of the double central suture. I consider the latter the better way of tying



F. F. Flap of mucous membrane.
K. K. K. Knots in the sutures.
S. S. Single sutures.
D. Double suture.

the sutures, as the former sometimes causes the middle edge of the lid to evert a little too much. The edges of the wound in the lip, which causes very little inconvenience, are brought together with sutures, and it heals by first intention. The eyelids are dressed with an antiseptic dressing smeared with iodoform ointment, and left undisturbed for

thirty-six hours, when the sutures are removed. The object of having the knots a couple of centimetres from the ends of the sutures is to facilitate their removal. The eyes are kept bandaged for a few days, so as to prevent any disturbance of the flap, *which takes readily.*

This operation was first performed by me in April, 1896, and during the following twelve months I operated on sixty-one cases. In two cases only the operation was a partial failure, as a few hairs on the outer canthi were touching the globe some weeks after the operation. The cause of these two partial failures was that the cartilage had not been divided up to the outer canthus. All the others were highly satisfactory, and some I have seen nine months after the operation. A special feature about this operation is that no tissue is removed from the lid, but tissue added to replace cartilaginous tissue at that part where it has undergone absorption. It produces no disfigurement, and the results are most satisfactory. The effect of the operation can be enhanced by a subcutaneous division of the outer canthus.

PRIMARY MELANOTIC SARCOMA OF THE LACHRYMAL CARUNCLE.

By SIMEON SNELL, F.R.C.S.Ed.,

OPHTHALMIC SURGEON TO THE SHEFFIELD ROYAL INFIRMARY.

IN the last number of these ARCHIVES (page 204) Dr. Veasey records a case of primary sarcoma of the caruncle, and mentions the few similar instances which have been published. Many years ago a case of melanotic sarcoma of the caruncle was under my observation, and it has not been placed on record. I take this opportunity of forwarding it for publication.

Mrs. B., aged sixty-two, was admitted under my care in the Infirmary on July 20, 1877. In the right eye was a tumor, involving and apparently springing from the caruncle and the plica semilunaris. It was about the size of a walnut and took very much the form of the caruncle and the plica. Its outer edge was well defined and overlapped half the cornea. There was no interference with the movements of the globe. Vision also was good when the eye was turned away from the tumor. The growth occupied half the palpebral fissure, protruding some little distance between the lids. It was of a dark sepia color and bled readily on being touched.

The patient stated that her son, nine months previously, had first called her attention to a black pimple in the inner corner of her eye. This had gradually increased in size, but its progress had of late been more rapid. The pain did not appear to have been very severe. Throughout life she had known little of sickness, and her general health did not now seem affected.

On July 25, 1877, the tumor was removed. The patient declined an anæsthetic. A tenaculum was passed through the growth, and with it the tumor was drawn forwards and carefully

dissected out. It was found to reach between the inner margin of the orbit and the globe. It was, however, fairly easily removed entire. A portion of the upper lid close to the papilla lachrymalis and to which the growth was firmly adherent was also excised. The conjunctival wound was closed with sutures. Recovery was rapid.

For some months the patient remained free from any return of the disease. Then a suspicious dot or two appeared, and on my seeing her for the last time in the course of the summer of 1878, the size of the recurrent growth was considerably larger than that of the one removed. She died, I was informed, in September, 1878, but no further particulars were obtained.

The note made at the time states that microscopic examination of the tumor showed it to be a melanotic sarcoma; pigmented spindle and round cells, the latter predominating, were noticeable; there was also free pigment.

SYPHILITIC NEURO-RETINITIS.[1]

By LYMAN WARE, M.D., Chicago.

MR. PRESIDENT AND GENTLEMEN,—Not to occupy too much of your time, yet desiring to call your special attention to some unfortunate phases of this truly melancholy disease, we will consider principally its clinical aspect. I say "unfortunate phases" because, not to prevent so terrible a disease, when possible, is doubly sad and unfortunate. It may be said that not all cases of neuro-retinitis are *syphilitic;* yet, according to my own observation and that of others of greater and wider experience, at least 70 per cent. are.

In the prevention of a disease it is not always necessary to go back to childhood or the great-grandparents, however desirable that might be.

In my own experience, extending over many years, I do not recall a single case of syphilitic neuro-retinitis following thorough and prolonged anti-syphilitic treatment. By thorough and prolonged anti-syphilitic treatment I mean mercury given more or less continuously for two or three years, then irregularly or intermittently for ten or twelve years more. Mercury I believe to be curative, while the iodide of potash, in the early stages at least, is only palliative.

When the secondary symptoms are obscure, that is, when the roseola eruption is scarcely recognizable and there are few or no mucous patches in the mouth, it is far too common for the physician to congratulate his patient upon the mild type of the disease and the consequent rapidity of recovery. After a few weeks, or at most a few months, treatment is wholly discontinued and such cases may not again be seen

[1] Read at the meeting of the Illinois State Medical Society.

until the disease returns in a form a hundred-fold more severe and obstinate than when first observed. It may manifest itself in the form of attacks of epilepsy, hemiplegia, general paralysis, or complete blindness. Although there may be some eye diseases as there are general diseases, which run a certain course and terminate spontaneously in perfect recovery, syphilitic neuro-retinitis never does. Without treatment it is sure to end fatally. The most skilful treatment, even when begun at an early stage of the disease, may prevent a fatal termination in many cases, yet how often does it happen that life is rendered miserable and sad by partial or total blindness. I know there are many who consider large doses of potash, a hundred grains and upward, the only remedy in nerve-syphilis, and while I believe it of great value in arresting rapidly the disease in some severe or dangerous cases, I do not think it compares with mercury in eradicating the syphilitic poison. The manner in which the mercury should be used is of secondary importance. For years I relied mainly on inunctions, but there are many objections to such a method of treatment. Where it is possible to have a trained attendant, and the expense is not to be considered, I presume there is no better or more effective method of treatment. Of the different methods of hypodermic injections, I have never been well pleased until recently; either they have been too slow or too rapid in being absorbed. A number of years since, Julius Althaus, M.D., London, suggested a preparation of mercury for a hypodermic injection, which overcomes both objections. The preparation consists of:

Metallic mercury, 1 pt.
Lanolin, 4 pts.
Carbolic oil, 2 per cent., 5 pts.

10 minims of which represent 1 gr.

The usual dose, 5 minims, may be gradually increased to 10, giving an injection once a week in the region of the glutei muscles. In whatever form mercury may be given it is of great importance to determine the condition of the kidneys, the chief eliminator. Should albuminuria be present, mercury must be given in small doses and the condition of the kidneys carefully watched.

There is little or no pain produced in giving the mercury in this manner, and only the ordinary care as to cleanliness, necessary. Patients sometimes complain of pain in the lower limbs for a day or two afterwards, but it gradually subsides without leaving any unpleasant effects. Owing to the carbolized oil, the preparation can be kept indefinitely. As these injections are given but once a week, the patient is not subjected either to great expense or inconvenience. He is also placed upon gradually increasing doses of iodide of potash, but not to exceed 120 grains three times daily. Tobacco, both smoking and chewing, spirits, and all excesses absolutely prohibited. In those cases of tolerably good health, where they eat and sleep fairly well, the mercury may be a sufficient tonic. In anæmic cases, where the appetite is poor and digestion bad, general tonics may also have to be given, for example, iron, preferably the perchloride, quinine, maltine, with hypophosphites and cod-liver oil. I would beg to call your attention to a few illustrative cases.

Case 1.—Mr. B., aged forty-eight, a diamond dealer, contracted syphilis in 1876. Secondary symptoms were slight. The disease was diagnosticated and the patient treated by a well-known specialist. The treatment, which was principally mercury, was more or less constant for two years, when all treatment was discontinued. In 1890, fourteen years after infection, I first saw the case. Aside from being exceedingly irritable and some pain in the occipital region, he was fairly well. His principal symptom of nerve trouble, and the one which caused him to seek advice, was a constant and most annoying yellowish tint to all objects. His most beautiful and clearest diamonds appeared only third- or fourth-rate on account of this yellowish tint. There was no apparent change in the fundus of the eye; the vessels and color were normal. He was placed at once upon inunctions of mercury, and gradually increasing doses of potash. While the pain in the head and general irritability became better, his vision grew worse. Within two months from the time I first saw him, neuro-retinitis made its appearance in both eyes. Dr. Hotz of Chicago and Dr. Knapp of New York also saw him, and both quite agreed in the diagnosis. Later, he took a course at Hot Springs, Arkansas, and while vision was for a time improved he soon lost what little sight he had, complete atrophy succeeding the neuro-retinitis. At the present time, aside from blindness, his condition is as

good as ever; he sleeps well and appetite is good; no subjective or objective symptoms of disease.

Case 2.—Mr. C., aged thirty-one, farmer and general laborer. Hard chancre 1892; was treated for about one month with small pills, presumably mercury. In 1894 vision began to fail in right, and very soon after in left. At that time he visited Hot Springs, Arkansas, and was treated by inunctions and potash; treatment lasting about one month. First came under observation November, 1896. Headache constant, but worse at night. Appetite poor; appearance, pale and emaciated. V R $\frac{15}{60}$, L $\frac{15}{40}$, neuro-retinitis and choroiditis. Was placed at once upon hypophosphites and small doses of bichloride. Afterwards hypodermic injections of mercury and lanolin, as already given, and gradually increasing doses of potash. On account of his general condition being so poor, the potash was not given in larger doses than 60 grains three times a day.

After a few weeks' treatment, headaches wholly disappeared, and vision has much improved. Dr. Chas. H. Beard has kindly made a drawing of the fundus as present seen. V R $\frac{15}{20}$, L $\frac{15}{30}$, which is somewhat surprising considering the changes that have already taken place.

Case 3.—Mr. N., aged thirty-two, railway brakeman, contracted syphilis in 1892; was treated irregularly for one year, no treatment subsequently. In December, 1896, was obliged to discontinue work as he could no longer distinguish signal lights. During the next few weeks his vision became rapidly worse. When seen in February, 1897, V L $\frac{15}{60}$, R $\frac{15}{40}$. At once hypodermic injections of mercury and increasing doses of potash were given. Dr. Beard has also kindly made a drawing of this case.

V at the present time normal: L $\frac{20}{20}$, R $\frac{20}{20}$.

Color sense also perfect.

Case 4.—Mr. K., aged twenty-eight; ship carpenter, had chancre, 1889. Was under treatment only a few weeks. Two years subsequently, was treated for one month at Hot Springs, Arkansas. No other treatment. Came under observation March, 1897. V L $\frac{15}{30}$, R $\frac{15}{40}$. Neuro-retinitis. Central scotoma for red in right eye and beginning in left. Received hypodermic injections of mercury, and general tonic treatment. Vision now nearly normal: L $\frac{15}{20}$, R $\frac{15}{30}$.

Case 5.—Mr. D., aged forty; wholesale drygoods, contracted syphilis in the latter part of 1885. Secondary symptoms

obscure. Was treated a few months with protiodide of mercury and apparently cured. Shortly after, he went abroad on business and while absent consulted a well-known specialist, who placed him upon mercury with chalk, which he took more or less continuously for two or three years, and then discontinued all treatment. He came under my observation in January, 1897. Had been having headaches for two or three months, particularly at night, which had become much worse the last few weeks, so much so as to prevent sleep. Bilateral neuro-retinitis with central scotoma for red in each eye. V L $\frac{15}{40}$, R $\frac{15}{60}$. Periosteal node of right temple. As there was some objection to hypodermic injections, and as he wished his medicine in pill-form, if possible, he was placed upon pills consisting of

Pot. iodid.,	Grs. 2.
Syr. fer. iodid.,	5 m.
Hyd. bichl.,	1/64 gr.
Liq. arsen. et hyd. iodid.,	2 m.
Tr. nuc. vom.,	2 m.

Sig., 1 to 2 after each meal.

After a few weeks' treatment the headaches completely disappeared; vision now normal, and periosteal node hardly perceptible.

With the experience I have had, I would not place much confidence in so mild a preparation of mercury as that of mercury and chalk, however long it might be given. In those cases where mercury should be long continued and the patient seldom seen, I think the above combination invaluable. Heretofore it has been difficult to give potash in pill form, but now that it is possible it is often a convenient form for those engaged in active business and away from home.

In those cases where the color sense was early affected or an absolute central scotoma existed, vision was often more or less impaired however energetic the treatment. Treatment of these cases unless long continued will be followed by frequent relapses.

If I have succeeded in calling your attention to the prevention of these unfortunate cases, and thereby save a single being from blindness, I shall consider myself fully repaid.

SOME UNUSUAL CONGENITAL DEFECTS OF THE IRIS.[1]

PARTIAL ANIRIDIA—CORECTOPIA, SLIT-SHAPED PUPIL—PSEUDO-COLOBOMA.

By WILLIAM CAMPBELL POSEY, A.B., M.D., PHILADELPHIA.

(*With five figures on Text-Plate V.*)

SO much has been said of late about the anomalies of the iris, and the subject has been studied so exhaustively by competent ophthalmologists, that I would hesitate to recall it to your attention were it not for the fact that I have recently had an opportunity of observing two cases, which exhibited such unique types of these conditions that I deemed their rarity would be sufficient excuse for their presentation. A further reason is the hope that the findings which I have observed in these cases may throw some light upon the etiology of this class of malformations.

CASE I.—Mary F., æt. twelve years.

There was no family history of ocular defect or disease. The patient's eyes had never been inflamed, and beyond their being very sensitive to light they had never occasioned her any distress until several months ago, when she began to have headaches after reading.

The child is healthy and well formed; face is slightly scaphoid; forehead prominent; nose slightly deflected to right. Both palpebral fissures are normal in size and direction.

As shown in the Plate V. fig. 1 sketch, O D., the cornea is clear, the corneo-scleral junction being well defined. The iris

[1] Read, in abstract, before the Ophthalmological Section of the American Medical Association, in June, 1897.

Illustrating Dr. W. C. Posey's paper.

FIG. 1.

FIG. 2.

Case I.—Partial Aniridia.

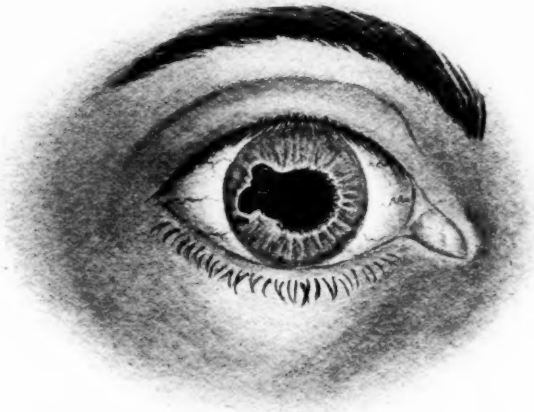


FIG. 5.

Case III.—Pseudo-Coloboma of Iris.

FIG. 3.

FIG. 4.

Case II.—Corectopia; Slit-Shaped Pupil.

is rudimentary, being only 2 *mm* wide in its broadest part, and would appear from a casual inspection to consist of a ribbon-like ring with irregular edges, but without any definite structure surrounding a large black pupil. Careful study with a Hartnack lens, however, shows that the iris is made up of one well developed and two smaller and less defined roots or segments which are crescentic in form, and join with one another to form a complete ring of iris tissue. The outer half of the iris, which is about twice as broad as the inner, is represented by the largest segment, and is made up of a base of fibres running at right angles to the limbus, and of another series of fibres which converge from the periphery, both above and below. There is the suggestion of a few sphincter fibres near the pupillary margin of the iris segment, and in addition a few crypts may be seen embedded in it. There is no trace of a greater or lesser circle. The fibres which form the base of the crescent and have a general direction at right angles to the limbus, seem to be folded under the pupillary edge of the iris, and this appearance is further strengthened by the absence at this point of the narrow pigment line which borders the pupillary edge of the crescent elsewhere. The upper arm of the segment terminates directly above, at about 90°, and is slightly overlapped by the outer extremity of a second segment, whose base is up and in at about 60°. This segment is much less distinct than that just described, but has essentially the same structure. The third segment resembles the foregoing closely, its root being at about 15° off the vertical down and in. Owing to this curious structural arrangement the pupil is quadrilateral in form, with its long axis at about 45°. At the points where the extremities of the segments join one another, the rim of iris tissue intervening between the pupil and the limbus of the cornea is so narrow that there is the appearance of distinct notches in these positions. The edge of the lens, however, is not visible through them.

O S. The iris is much more rudimentary, but up and in, at an angle of about 140°, there is a well developed crescent, quite analogous to those in the fellow eye, and a much smaller one below, which conforms to the same type. These segments are parallel to one another. The edge of the lens is plainly visible at the junction of their extremities, viz., at the temporal and at the nasal side and below and slightly in, but there is no overlapping of the segments. The pupil is quadrilateral, and has a general axis of

45°. The sclero-corneal margin is sharply cut, and the cornea is clear save for a small superficial triangular nebula below, which encroaches on the cornea to the extent of 2 *mm.* The pigment line bordering the pupillary edge of the iris is very narrow, being reduced to the merest trace in the outer edge, and wholly wanting on the nasal side.

Ophthalmoscopic Examination.—O D. The media are clear. The disc is vertically oval and is slightly superficially over-capillary. There is a choroidal ring all around except up. Rest of fundus healthy.

O S. There are three localized opacities in the posterior pole of the lens, although the rest of the lens is quite clear. The disc is vertically oval, and is slightly superficially over-capillary with some distention of the lymphatics of the retinal vessels. Rest of fundus healthy.

O D V $\frac{5}{10}$ C 1.5 D ax. 100 $\frac{5}{10}$ Ty. 0.50 D 8″ to 15″.

O S V $\frac{5}{25}$ C 1.5 D ax. 150 $\frac{5}{20}$ Ty. 1 D 10″ to 12″.

CASE 2.—Michael van P., æt. five years.

This patient was brought to me at the Howard Hospital, April 25, 1896, on account of an inflammation of his eyes of several weeks' standing. There was marked photophobia, and considerable lachrymation in both eyes, occasioned by the presence of several small phlyctenulæ on the cornea. After a few days of appropriate treatment, the eyes improved to such an extent that I was enabled to make a thorough examination of them. As is well shown in the sketch, in the right eye there is corectopia, the pupil being displaced down and out. The pupil is ovoid, its apex being directed down and out, and reaches to within 1 *mm* of the limbus. The sphincter is perfect and the iris reacts well to light stimulus.

Left eye. Slit-shaped pupil. The iris is almost halved, being composed of two concave segments, united at the corneo-scleral junction by a narrow band of iris tissue, which overlap below, whilst they are evenly approximated above. The pupil extending obliquely across the eye at an axis of about 70° is 1 *mm* wide, and reaches almost to the corneal margin.

The sphincter is fully developed in both halves, but seems to be absent at the lower and upper isthmus of connection between the segments. When shaded, the pupil dilates into an ellipse 2½ *mm* in its broadest portion, but reacts but slightly at the angles. The rest of the iris tissue appears normal.

There are no traces of inflammation other than the superficial nebulæ, the remains of the phlyctenular ulceration for which the patient sought treatment.

The ophthalmoscope reveals a slight hypermetropic astigmatism in both eyes. The media are quite clear, and there are no other evidences of departure from the normal in any other of the ocular structures. The vision is normal in both eyes. The mother said the child had eyes like a cat from his birth.

The first case is an instance of partial irideremia or aniridia, an incomplete absence of the iris. While many authors would lead us to believe that instances of total absence of the iris do exist, althougn uncommon, it is probable that in the majority of cases the iris is present, but to such a rudimentary extent that it is hidden from clinical observation by the opaque corneal border. Despagnet, indeed, goes so far as to say that there is in all cases of aniridia some trace of iris tissue at the periphery.

Although the existence of a rim of iris tissue has often been referred to previously, after a careful study of all the reported cases of partial absence of the iris, I have failed to find any description of the structure of this rudiment in instances which correspond to the findings which I have recorded in the notes of my first case, and I believe the observation of the findings there, *i. e.*, its segment-like character, to be quite unique.

Although not noted in connection with aniridia, isolated segments of iris tissue, however, have been recorded in a number of instances. Lusardi[1] reports a case of complete aniridia in the right eye, while in the left there was only a half-moon-shaped segment visible at the lower portion of the cornea, about a line in breadth. There was a small capsular opacity associated with it. Henschel[2] cites a similar instance. The structure of both of these segments was passed upon by Sichel, who examined them under high power and found that they consisted of iris tissue. Hedinger[3] saw only a lower segment. Wallisford[4] one down and out, and Cazentre[5] one in, and another directly opposite out. Sichel[6] gives a beautiful illustration of a segment, which was situated down and out, and Rindfleisch[7]

has written a full description and has added an excellent sketch of a similar structure which occurred on the temporal side of an eye otherwise bereft of iris tissue. The fellow eye exhibited no trace of iris. In this case the segment of iris corresponded exactly with those cited in my first case; it was crescentic in form, and was provided with a narrow pigment line on its free border, with a suggestion of a small iris circle and sphincter at the broadest part, and with a series of fibres which converged towards the root.

None of these authors has vouchsafed any attempt at explanation of what these segments are or what their origin may be, and as no microscopical study has ever been made of one of them, any theory which might be advanced regarding their genesis would be purely hypothetical. From what we already know, however, of the embryology and organology of the eye, it seems to me to be possible to draw some deductions which may explain their occurrence and give us substantial aid in elucidating and elaborating the different steps in the normal development of the iris.

We know that the root of the iris, *i. e.*, the marginal portion of the secondary optic vesicle from which the iris springs, is essentially a vascular tissue, consisting of but little more than a network of blood-vessels, supported on a delicate connective tissue, which is derived from the endothelial layer and a few spindle cells from the anterior layer. The vessels are formed through the union of the long and anterior ciliary arteries, which anastomose to form the major circle of the iris. From this circle small branches are given off which run inwardly between the cornea and the lens, and represent the chief blood-vessels of the iris. Each of these vascular loops is surrounded with connective-tissue cells which become the stroma of the iris. These vascular twigs with the proliferating cells about them protrude into the anterior chamber and viewed at this stage would represent, to my mind, a segment quite analogous to those which have just been referred to, and if the process of development stopped here, we would have an appearance similar to that noted in my first case, *i. e.*, a number of more or less isolated roots or segments. Later a union of these segments occurs

and the complete iris is formed, the ring-like character of the pupil being given it as a result of the peculiar arch-like form of the vessels after they unite to form the minor circle.

If these segments represent, as I believe, the proliferation of tissue around a twig of the major circle of the iris, and if the iris really grows in this manner, through a primary protrusion of these twigs, then the explanation of many forms of anomalies of the iris would be a simple matter, for we need only suppose an absence of one or more iridal capillaries to account for a defect in the membrane in any position or to any extent, and the occurrence of the isolated segments which have been cited would be readily explained. Although this theory is hypothetical, all others which have been advanced to explain anomalies of the iris are also liable to the same reproach, for they are all founded upon clinical observation and insufficient microscopical proof. The theory of a vascular origin to explain these anomalies is not a new one, for in the beginning of the century Arnold [8] and Seiler [9] drew attention to the fact that if there be an anomalous distribution of the long and short ciliary arteries, or if one or all of these vessels be absent, then the iris could only partially develop, and that coloboma of that membrane could be readily accounted for in this way. The idea that these anomalies are the result of an anomalous distribution in the vascular supply agrees also with the most recent observations upon their causation, for no less an authority than Bock [10] says that the greatest importance must be attached to the vascular system and its anomalies under all circumstances in studying coloboma of the eye.

Hess's [11] theory, which attributes the coloboma to the hindrance offered to the ingrowing of the iris by the presence of connective-tissue bands, the remains of blood-vessels, also favors the theory of circulatory disturbance, for Ginsberg [12] has pointed out that these bands could only operate in two ways, either mechanically similar to the action of the amniotic bands, or by inducing a change in the circulatory conditions of the iris, as a result of the patulency of certain iridal vessels. Manz [13] and Plange [14] also, both of whom have made extensive researches upon the subject, while

they do not mention the possibility of an anomalous distribution in the vessels of the iris originating congenital defects in that membrane, believe that the persistence of the pupillary membrane, which the latter author attributes either to abnormally developed vessels, or to a union of the vessels of the sac with the capsule of the lens, offers an obstacle to the protrusion of the iris between the lens and the cornea, and thus acts as a causal factor in the genesis of coloboma of the iris.

The theory advanced by Rindfleisch,[15] of an intra-uterine inflammation of the tissues about the corneal limbus and the obstruction offered to the protrusion of the iris into the anterior chamber by the consequent adhesion between the cornea and lens, cannot hold in cases where the ring of opacity in the cornea resulting from such an inflammation is wanting, or where there are no other evidences of a fœtal inflammation. This theory also seems to me to have the same objection as that offered by Tockus[16]. This author advanced the hypothesis that the growth of the iris is impeded as a result of increased intra-ocular tension, whereby the iris becomes pressed against the cornea. Both of these theories suppose the existence of conditions which would close the angle of the anterior chamber, and as the most common result of this is glaucoma, we would expect to find glaucomatous symptoms in many if not all of these cases, whereas we know that the association of glaucoma with malformation of the iris is an extremely rare affection.

You see then, gentlemen, that all of these theories which have been proposed to explain these conditions have their objections, and while that which I advance is purely hypothetical and has never been subjected to microscopic proof, to me it is a most attractive one, for it is more comprehensive than any of the others, and when we consider the frequency with which anomalies of the retinal vessels are met with, as well as those of the vascular tunic of the lens, it seems to me that we are obliged to admit the possibility of an anomalous supply in the iris, and the consequent asymmetrical development which it would occasion.

Moreover, the existence of a close phylogenetical relation-

ship between different anomalous conditions of the iris as suggested by the presence of different anomalous conditions in the same subject in so many instances, finds ready explanation by this theory. Suppose some slight irregularity in the proper distribution of one of the twigs—and corectopia would result; suppose that one of these twigs were entirely absent, and coloboma is explained; suppose the anterior or long ciliary artery were absent, one or both, and we would have a coloboma of the iris which would involve its root, the ciliary body, and perhaps the choroid as well. The cases of corectopia, reported by Best,[17] which are associated with coloboma, irideremia, and polycoria could all be readily accounted for, as could the observations of Lusardi,[18] Villards,[19] Manz,[20] and Rindfleisch[21] of a segment of iris in one eye—and aniridia in the other, as well as my second case, in which there was corectopia in the right, and a typical coloboma in the other eye.

In this case the left iris consists of two segments of iris tissue, semilunar in form, which are joined at their extreme points, the one slightly overlapping the other. Imagine a union between the two upper and the two lower extremities of these segments, and what results—a pure example of atypical coloboma of the iris. Imagine a union of the upper and lower segments as well, and what results—either a normal iris, or, if there had been some hindrance to the proper accomplishment of the act, a corectopia. Indeed, there is no anomalous condition of the iris which cannot be moulded by a union or non-union of these segments, and I believe that we have in them the missing link, as it were, which proves the transitional nature of all anomalies of the iris, and demonstrates that they all represent but different stages or degrees of interference with the normal vascular supply of that membrane.

As a result of the curious conformation of the left iris, just described, my second case presents another interesting and very rare anomaly, a slit-shaped pupil, which extends diagonally from the upper and outer limbus of the cornea to the lower and inner corneal margin.

After quite an extensive search through ophthalmic litera-

ture, I have been unable to find but few cases which had any resemblance to it. Wilde [22] gives a sketch of a case seen by Mr. W. W. Cooper, where the pupils represented, in their contracted states, a fine transverse line extending nearly across the outer breadth of the irides, but dilating into an elliptical aperture in a modified light, or under the influence of belladonna. The vision was perfect, and there was no hereditary tendency to other malformations of the eyes. No mention is made of the structural appearance of the iris, and as the sketch is crude it is impossible to say whether there were two distinct segments, as in the case which I have reported, or not.

Tourtual [23] observed a somewhat similar case, and Chodin [24] has reported an additional instance where the pupil had the same direction as in the case I have just cited, *i. e.*, from up and out to down and in. There was a slit-shaped pupil in the other eye, with a general direction perpendicular to that of the fellow eye.

In both of these eyes there were evidences of inflammation of the cornea which led Rumskewitsch [25] to question whether they should be regarded as actual malformations.

Cornaz [26] cites two additional cases. In the first, which was observed by Bloc, there was a history of the transmission of the anomaly through several generations. The second was seen by Rites. The history of this case is very meagre, for the author merely states that he observed such a peculiarity of the pupil in one of his cases.

Through the kindness of Dr. Charles A. Oliver I am able to present another instance of segment defect in the iris, one in which the anomaly involved a part of but one layer of the iris, the anterior or mesoblastic, the posterior or epiblastic being developed normally throughout the entire extent.

As is strikingly shown in a water-color drawing, from which plate 2, Fig. 3 has been sketched, the pigment layer of the iris is exposed to view over an irregular quadrilateral area to the temporal side, owing to an absence of the stroma of the iris at this point. At the root of the iris, the stroma, however, is still present, and when it is subjected to close scrutiny the rim or root is seen to be analogous to the segments cited in

the two previous cases, and the defect may, I think, be explained similarly to them.

It is interesting to note that Franke[37] observed a case where the pigment layer was absent, but the stroma present over an area which closely resembled that of the case just cited. These occurrences do not seem strange if we consider the comparative independence of the layers of the iris, during the development of that membrane. Both protrude into the anterior chamber at about the same time, but there is no union between them until the minor circle of the iris has been formed. It is probable, however, that the proper development of the posterior layer is dependent in a measure upon the presence of the anterior, for, as we have seen, it is the protrusion of the vascular twigs with the proliferating cells about them, which gives the impetus to the further formation of the iris. Should the development of the anterior layer be retarded, therefore, further protrusion of the posterior layer would probably cease also. This occurred in the first case of partial aniridia, a narrow line of pigment being plainly visible all around the iris ring. In the case just cited, however, it would seem that the impulse given the posterior layer from the almost perfectly developed anterior portion of the iris was sufficient to cause it to develop in the gap occasioned by the break in symmetry of the iris tissue. The iris in the fellow eye was normal.

Through the courtesy of Dr. H. Knapp, I am enabled to add the notes of a fourth case, seen by him in his clinic, in which there was a typical coloboma in one eye and polycoria in the other. This case was seen in another clinic, and is reported by Dr. Schapringer[38] in the *New Yorker Med. Monatsschrift*, June, 1897. In the right eye there was a large coloboma below, in the median line, while in the fellow eye the true pupil, which was smaller than normal, was slightly displaced toward the nasal side. To the temporal side there were three accessory pupils, oval in form, with their long axes horizontal. They comprised all of the layers of the iris, and were separated from one another by rather broad bands of tissue. All three pupils were situated on the temporal half of the iris in a segment-shaped area, the rest of the mem-

brane being normal. In addition to the accessory pupils, this segment exhibited the additional peculiarity of consisting of but one layer of iris tissue, the posterior, the anterior being absent.

This case is a further example of the co-existence of different types of anomalies of the iris in the same subject, and is of interest as it shows the origin of the polycoria in a defect in all of the layers of the iris.

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PARESIS OF THE EXTERNAL RECTUS FROM INDIRECT VIOLENCE.

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THE following obscure case came under my observation in October, 1894, and gave this history:

On March 31, 1894, a trolley car collided with the wagon in which the patient was driving, and he was thrown violently to the ground, striking on the left side of his body. He was, when picked up, suffering great pain, and was removed to a hospital, where a severe contusion was found over the region of the heart. The surgeon at the hospital did not notice any trace of injury about the head, and was positive that no symptoms of concussion of the brain were present. Three days after the accident the patient left the hospital, returned home, and summoned his family physician, who discovered a valvular cardiac murmur to be present, although none had previously existed, an evidence that the heart had received injury from the traumatism. This murmur remained permanently.

Six months later his physician referred him to me on account of the diplopia with which he was troubled. He stated that from the time of the accident he had been unable to read for ten consecutive minutes without diplopia, and that this also appeared at all times when he became tired or nervous.

On examination I found a paresis of the external rectus of the right eye, characterized by imperfect outward rotation of the eye, associated with diplopia, which increased as the eyes were rotated to the right, with parallel images. During the early part of the examination this diplopia was confined to the right side of the field, separated from the area of binocular single vision by a line which ran from about 10° to the left above to 20° to the right below the horizontal meridian, thus passing a little to the right side of the line of central vision. The patient had therefore binocular single vision when his eyes were directed straight ahead, but a prolonged examination demonstrated that the right external

rectus easily became fatigued, a condition which resulted in a displacement of this dividing line to the left, so that diplopia ensued while the eyes were in the same position as before.

With the proper correction the vision in each eye was $\frac{20}{20}$. The field of each eye was perfect. No lesion within the eye could be found with the ophthalmoscope. I could not elicit from either the patient or his physician a history of any disease which is known to be capable of producing such a condition. On the contrary, both agreed in ascribing the diplopia to some injury received at the time of the accident, and, in spite of the obscurity of the lesion, his physician could not suggest anything from his knowledge of the patient which would aid in clearing the diagnosis.

In July, 1895, the patient informed me that his condition remained the same, but I was unable to persuade him to come to my office for another examination, and have not since then heard from him.

The only similar case of which I have found a record is one mentioned by Dr. Noyes in the second edition of his treatise on *Diseases of the Eye*. In that case, a gentleman was thrown from a horse, struck on the left shoulder and left side of the head, and was stunned, but did not lose consciousness or vomit. Subconjunctival ecchymoses appeared in both eyes. On the following day, he had ptosis of the right eye and diplopia. When reported, the ptosis had practically disappeared, but the diplopia required for correction a prism 10° base up and a prism 15° base out over the right eye. The diagnosis made was that of probable injury of the wall of the right orbit, and as the patient struck on the left side of the head this was a possible result.

In both of these cases the patient was thrown violently upon his left side, and sustained an injury which affected the external rectus of his right eye. In my own case I consider fracture of the orbital wall to be in the highest degree improbable. The injury appears to have been permanent in its nature, and its probable explanation would seem to be that the injury affected the abducens and was dependent either upon the cardiac lesion, or, if independent of this, upon a slight and unnoticed degree of concussion of the brain.

THE NORMAL DIRECTIONS OF THE PLANES OF VISION IN RELATION TO CERTAIN CRANIAL CHARACTERISTICS.

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IN regard to the ability of the eyes to rotate in the vertical direction, I have found that, under the best conditions, the full extent of the excursion amounts to about 83° of arc, and that of this excursion 50° is below the horizontal plane and 33° above it. This adjustment, since it is found to be the most favorable to the continued use of the eyes, and since it exercises no unfavorable influence in inducing either lateral deviations or tendencies toward deviations, and since also it induces no excess of the torsional effect in the act of convergence with depression of the plane of regard, may be expressed by the term *Eutropia*, meaning a favorable adjustment.

If the total excursion of the eyes remains of about the same extent (83°), but if the ability to rotate them upwards is materially greater than in eutropia, that is, if it equals or exceeds 36°, while the downward rotation is restricted to a corresponding extent, the condition is that of *anophoria;* while a failure to rotate the eyes up to the extent of, say, 30°, while the downward excursion is increased, is designated as *katophoria.* It will be observed that a margin of 3° on each side of the standard of upward rotation for eutropia (33°) is regarded as within the limits of this condition. In the great majority of cases this is practically correct, yet there are instances in which this margin is too great either in respect to the physical, that is the mechanical, effects upon

the eyes, or in respect to the absence of asthenopia or other nervous manifestations.

In order to obtain exact and uniform measurements of the excursions of the eyes, the head of the person observed is to be placed and maintained during the examination in a position such as has been elsewhere described.[1]

Very soon after bringing the tropometer to its present state of adaptability to its purpose, and learning something of the peculiarities of ocular rotations from more critical methods than had hitherto been employed, it became evident that certain peculiarities in the excursions of the eyes, in the vertical direction especially, were, as a rule, associated with certain types of the cranium. The more attention was directed to these coincidences the more certain did it appear that there was, in this relation, an important law which would well repay more than a casual thought.

As investigations proceeded it was found that three classes of ocular conditions were in close relation with the three great types of crania recognized by anthropogists and craniologists, and that the facial angles also, with some modifications from the usual rules of craniological measurements, serve as the indications of the directions of the eyes with reference to the horizon in passive adjustment.

In order to obtain a clear conception of this law, so far as it has been developed, some knowledge of the types of the cranium and of some of the angles of the face is requisite.

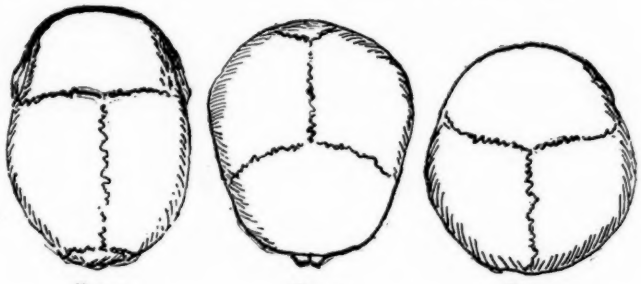

FIG. 1. FIG. 2. FIG. 3.

The long, medium, and broad skulls as seen from above.

[1] *Ophthal. Record*, April, 1897.

Craniologists classify skulls as: *Dolicho-cephalic* (long skull), *Meso-cephalic* (medium skulls), and *Brachy-cephalic* (broad skulls).

Figure 1 shows the general shape of the long (dolicho-cephalic) skull as seen from the top; Figure 2 a medium (meso-cephalic), and Figure 3 a broad (brachy-cephalic) skull.

These three types are distinguished by what is known as the cephalic index, which is the proportion the breadth of the head bears to its length, assuming that in every case the length is represented by 100.[1]

In the meso-cephalic skull the cephalic index is about 80, while if the index is as low as 75 the skull is long, and if as high as 85 or exceeding that figure it is a broad skull.

Associated with each of these three types of crania are found also distinct types in the form of the orbit, thus with the long skull the orbit is long and low, in the medium arched and high, and in the broad skull long, low, and obliquely placed (see Figs. 10–12).

FIG. 4.—The Prognathous Face and Dolicho-cephalic Head. Facial angle, + 15°; upward rotation, 28°; downward, 55°.

FIG. 5.—The Orthagnathous Face and Meso-cephalic Head. Facial angle, 0°; upward rotation, 42°; downward, 45°.

[1] For example, suppose that the greatest antero-posterior length of a given skull be 19 centimetres and the greatest breadth 15.2 centimetres; then, 19.0 : 100 :: 15.2 : 80. That is, the cephalic index in this case would be 80, the breadth being 80/100 of the length.

If the facial angle is low, the line of the face being nearly straight, as in the typical European face, the face is said to be *orthagnathous.* If the angle is high, as in the typical African face, it is *prognathous;* and if the angle of the face is negative, the face being concave or hollowed in, it is *opisthagnathous.*

FIG. 6.—The Opisthagnathous Face and Moderately Brachy-cephalic Head. Facial angle, — 10°; upward rotation, 22°; downward, 40°.[1]

Figure 4 is an example of the extreme prognathous face, and Figure 5 is an example of an orthagnathous face. Figure 6 shows the opisthagnathous form. These figures I have drawn from cases in which I have carefully tested the vertical rotations. The extent of vertical rotations given in each case, while, of course, applying only to the individual, fairly represents the state of the vertical rotations which may be found in heads of similar form with similar facial angles.

If we examine a large number of heads we shall find that prognathism is very commonly associated with the long head, orthagnathism with the medium, and opisthagnathism with the broad head.

While authorities are agreed in regard to the indices which characterize the three types of head, they are less in accord in regard to the situation of the angle which constitutes prognathism, for while Broca and his French colleagues estimate prognathism by the angle formed by the alveola with a specified base line, Benedikt and his German asso-

[1] From drawings by the author from cases in which the ocular rotations had been carefully determined.

ciates estimate it from the angle formed by the line drawn from the middle of the root of the nose to the lower border of the upper jaw and the basal line already mentioned.

In the examinations which I have made bearing upon the relations of horizontality of vision to the various heads and faces of living persons, some departures from the lines laid down by craniologists, who conduct their researches largely on dead skulls, have been found necessary.

In order to arrive at any precise results regarding the excursions of the eyes, it was essential that points be selected by which perfect uniformity in all examinations should be maintained in respect to the vertical position of the head.

FIG. 7.

FIG. 8.

Stevens's Facial Goniometer and Craniometer.

Two points, the upper being the slight elevation in the median line between the two superciliary ridges, the lower the convexity just below the nasal spine, were selected as points which should, in every case, be in a vertical line when the head is in the primary position. This vertical line varies

slightly from a vertical which would be drawn at a right angle with Broca's horizontal line of the skull, but this latter line is impracticable in the living subject. In respect to prognathism the angle is measured from the point between the superciliary ridges, the concavity in the upper jaw below the nasal spine and the tip of the chin, the feet of the goniometer in each case being pressed firmly toward the bone. The upper angle of the face has for its three points the sulcus below the nose, the point between the superciliary ridges and the summit of the convexity of the forehead. This latter angle is, so far as my measurements have indicated, more variable with respect to the general classification of skulls than that of the lower part of the face.

A third angle, corresponding practically with the angle of Jaquart, is measured from the upper wall of the meatus auditorius, the sub-nasal point, and the point between the superciliary arches. This angle is usually greater in proportion as the head has more of the orthagnathous character.

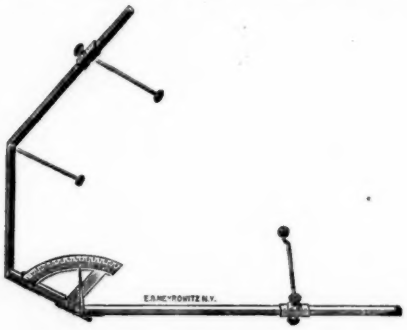

FIG. 9.—Instrument for Measuring Angle of Jaquart. Designed by Dr. Charles W. Stevens.

A craniologist will discover in these measurements deviations from the established rules, but these appear to be demanded by the circumstances. The measurement of prognathism by including the lower jaw appears to me to have more importance than is assigned to it in classical works. It certainly bears a very noticeable relation to the directions of the planes of vision.

Thus, having very briefly outlined certain elementary principles, first in respect to the rotations of the eyes, and then in respect to some cranial and facial characteristics, we are prepared to inquire whether certain states of the excursions of the eyes in the vertical directions are so commonly associated with certain cranial and facial peculiarities as to constitute a general law.

To this inquiry I am prepared to give an affirmative reply, while at the same time conceding that there is still much room for investigation and for classification of data.

The results of a series of carefully recorded observations of ocular rotations and of cranial and facial measurements continued during the past year may be briefly summarized as follows:

1. The condition which I have called eutropia is extremely rare. In not less than five hundred cases in which careful trials by the tropometer have been made since the present state of the instrument has been reached, less than one per cent. of the cases could be regarded as within the term, and of these some are doubtful as not having acquired an experience in making the efforts at ocular rotations which would warrant the assertion that the record from a few examinations proved the condition of eutropia. In the great majority of cases after sufficient practice, the upward vertical rotation either falls below 30° or exceeds 36°. There is thus an interval of about 5° to 7° in the records of upward rotation within which the limit of the excursion is rarely found.

In the class in which the upward rotation exceeds 36° it sometimes reaches 50°, or even more, while in the other class in which it fails to reach 31° it may fall as low as 15°, or even lower. Whether, in a greater number of examinations, this interval in the region of eutropia will be filled remains to be seen, but the fact of this hiatus may perhaps be compared with the remark of Benedikt,[1] that in the measurements of a great series of skulls he has not found a case of orthagnathism.

2. In meso-cephalic heads with approimaxte orthagnath-

[1] Benedikt, *Kraniometrie und Kephalometrie*, Wien und Leipzig.

ism, the rotation of the eyes is usually high with corresponding restriction downwards. For example, if the upward rotation is 40°, the downward rotation is liable to be restricted to 40°, or possibly 45°, as there is a greater latitude in this than in the upward rotation. If the head is quite high in proportion to its length, the upward rotation, as a rule, rises somewhat in proportion to the index of height.

3. In long heads, especially long heads with a high degree of prognathism, the rotation upwards nearly always comes short of the standard, and the downward rotation exceeds 50°. In these cases the chin recedes and is usually of the type commonly known as "weak chin."

4. In very broad heads, and especially in the condition called by Benedikt and other craniologists opisthagnathism, that is, in which the angle of the face from the point between the superciliary ridges and the tip of the chin is negative, the rotation is, in nearly every instance, restricted in both directions, but more especially in the upward direction. If, however, the ability to rotate up or down somewhat diagonally, that is upward and outward or downward and inward, is tested, the extent of rotation can generally be somewhat increased.

In these cases of opisthagnathism the head is large in proportion to the face, but it is usually short in the anteroposterior diameter and consequently the cranial index is very high. The head increases in breadth from the ears up to the parietal eminence. The lower jaw is usually noticeably less heavy than in orthagnathous faces, and in nearly every instance stands out prominently in front of the face, but differing from the heavy jaw of the tall head, which is also sometimes prominent, in that the former comes to a point or almost, in many cases, to a hook.

This class of cases for a long time appeared to me altogether exceptional, and occurred with such comparative frequency as almost to seem to disprove the rule of a relationship between the facial angles and the vertical rotations. The conclusion at first seemed natural, that if a long head and a strong facial angle suggested katophoria, and if a medium head with a straight face suggested anophoria,

then a very broad head and a concave facial line should indicate an extreme anotropia. That there should be a marked restriction of the upward rotation seemed inconsistent.

Referring to the figures below (Figs. 10, 11, and 12), we shall see a reasonable explanation of the apparent contradiction, and it will readily appear that the restrictions are really according to the rule.

FIG. 10.—Cephalic Index 71.4:100.

FIG. 11.—Cephalic Index 81:100.

FIG. 12.—Cephalic Index 85:100.

Front views of the long, medium, and short skulls, showing the form of the orbit corresponding to each type. From drawings made by the author from specimens in the Army Medical Museum, Washington.

The figures show that the form of the orbits is quite characteristic in the three classes of skulls. In the dolichocephalic (Fig. 10), the orbit is long horizontally and low, that

is, the orbital index is low, and the axis of the orbit is directed outward and downward. In the meso-cephalic head (Fig. 11), the orbit is strongly arched above, the orbital index being high. The orbital axis is directed forwards and upwards, and this direction, with the strongly arched upper wall, would conduce to an excess of upward rotation and a restriction of the excursion downward.

In the broad skulls, the brachy-cephalic (Fig. 12), the orbits are, like those of the long skulls, long and low, but they are also placed obliquely so that the line of greatest excursion would be not in the direct vertical line, but obliquely, and from the peculiarity of the form of the orbit in this class of skulls, it is easy to see that the vertical excursion both up and down should be limited.

In the cases of katophoria examined during the past six months, the average upward rotation has been 27°. The cephalic index[1] has averaged 74.07, and the average prognathism has been 7°.

In the cases of anophoria the average upward rotation has been 41½°, the average cephalic index 80.9, and the average prognathism has been 1½°.

In the cases in which the rotations have been restricted both in the upward and downward directions, the cephalic index has averaged 85.4, and the average prognathism is — 4°.

Placing these results in tabulated form we have:

In	Upward Rotation.	Cephalic Index.	Prognathism.
Katophoria	27°	74.07	7°
Anophoria	41½°	80.90	1½°
Rotations Restricted in both Directions	28°	85.40	−4°

Thus it will be seen that katophoria is usually associated with the long head and with the strong facial angle; anophoria with the head which is high but neither very long

[1] Owing to the presence of the tissues external to the cranium in the living subject, the cephalic index does not express exactly the same proportion as in the case of the prepared skull.

nor very broad, and in which the angle of the face is low; while restricted rotations both up and down are generally associated with the broad head and the negative facial angle.

It is not to be forgotten that in communities made up of different nationalities, many heads are composite in type, the upper part, the cranium, perhaps, belonging to one type, the lower, the face, to another. Such cases must of necessity cause greater variations from the rule which we have announced than would probably be found in a community of more common origin.

Craniologists who have made many measurements of the orbits and of their directions have not, so far as I have been able to learn, attempted to find the relations between the directions of the orbital axes and the types of crania.

This work I have attempted without the experience of the trained observer in this field and with only such material as I have been able to find in the possession of friends and in some public collections. The number of suitable crania included in my series has, therefore, been somewhat limited, yet has been sufficient to establish certain general propositions which may be formulated as follows:

In the dolicho-cephalic skull (index 78 and under) the axis of the orbit is directed below the plane of the horizon from 5° to 15° with an average of about 7° or 8° of depression. The orbital index averages about 79.

In the broad (brachy-cephalic) skull the orbital axis is also directed downwards, but in less degree, on the average, than in case of the dolicho-cephalic. Here the depression of the axis, ranging in my examinations from 4° to 12°, has averaged 6.5°. The orbital index, which has ranged from 82.9 to 87.5 has averaged 84.8.

The number of meso-cephalic skulls included in my series is too small, there being but fifteen of this class, to form a very correct estimate of the direction of the orbital axis. However, it may be said that the average direction rises somewhat above the plane of the horizon (in one case 12° above). The orbital index in these crania has averaged 86.5, ranging from 74 to 97.4.

In the determination of the direction of the axes of the crania examined, the skulls have been placed in the position chosen as the primary position of the head in the living subject, that is, with the glabella and the depression immediately below the nasal spine exactly vertical to each other.

Unfortunately for such an investigation a very large proportion of the crania found in the museums which I have visited in the pursuit of this study has consisted of the skulls of American aborigines, which, for obvious reasons do not serve the purposes of the investigation, and the number of meso-cephalic skulls is much less than the number of long or of broad skulls of the white races. The number of accessible crania, therefore, which are suited to the study is, in this country, quite limited. Before a just average of the directions of the orbits in the three principle types of crania can be determined, a larger number of skulls must be examined than I have thus far been able to observe. While the general propositions will, I think, be found to be correct, the average directions as I have here given them will most likely be found subject to modifications.

In the prosecution of my inquiries respecting the axes of the orbit in relation to the form of the crania, I have received important assistance from those in charge of the Army Medical Museum in Washington. These gentlemen not only placed the material in the museum freely at my disposal for the purposes of the examination, but they rendered me every personal assistance in their power.

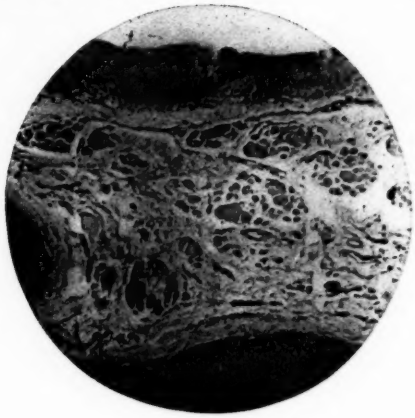

FIG. 1.

FIG. 2.

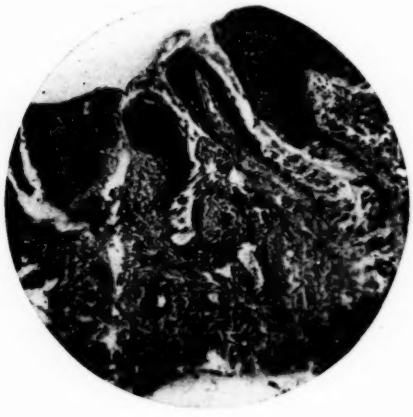

FIG. 3.

A SUPERNUMERARY CARUNCLE.

By J. W. H. EYRE, M.D.,

SENIOR OPHTHALMIC ASSISTANT TO GUY'S HOSPITAL.

(*With three figures on Text Plate VI.*)

WITH the exception of the case reported by Mr. Stephenson (*Ophth. Review*, vol. xv., Jan., 1896), I am not aware of any recorded case of supernumerary *caruncula lacrimalis*, and were it not for the striking similarity of the microscopical appearances presented by the congenital tumor about to be described to the normal caruncle, I should be extremely diffident about publishing my notes of the case.

W. H., male, aged twenty-eight years, consulted me with regard to the removal of a small tumor of the right upper eyelid. The history he gave was that the fleshy mass had been noticed at birth, and was believed by his parents to be a nævus. It had gradually increased in size during early childhood, but had remained stationary for the last fifteen years. It was in no way troublesome, but his fiancée refused to marry him until the unsightly tumor had been removed.

On Examination.—R. E. A small, raised, almost spherical tumor (three *mm* in diameter), was seen springing from the conjunctival margin of the upper eyelid, and situated in the interval between the papilla lacrimalis and the inner canthus; of a pale, pinkish color, and somewhat spongy appearance, but quite firm in consistence. The surface was invested by a layer of conjunctiva, and that portion which projected into the palpebral aperture showed a few fine hairs.

The tumor was removed, hardened in 2 per cent. formic aldehyde solution, embedded in paraffin, and sections cut. The sections were subsequently stained with hæmatoxylin and eosin.

In Quain's *Anatomy* (vol. iii., Pt. iii., page 2) occurs the following description of the normal caruncle: "A spongy-looking, reddish elevation formed by a small isolated portion of skin containing a few large modified sweat glands, as well as groups of sebaceous glands, which open into the follicles of very fine hairs. There is further found in it a small amount of plain muscular tissue as well as a few cross-striated muscular fibres."

A reference to the accompanying reproductions of photo-micrographs will show that the tumor in question is accurately and exactly described by the above quotation, whilst its situation and its congenital origin are points which are decidedly in favor of its being a genuine supernumerary caruncle.

Explanation of figures on Plate.

FIG. 1.—Photomicrograph of a section of the tumor, parallel to, and about 0.5 *mm* from, its base; showing superficial epithelial layer, connective tissue, and bundles of muscular fibres. (Watson's 1 inch objective and C ocular.)

FIG. 2.—Photomicrograph of one extremity of above section, showing free surface, hair follicle, sebaceous and mucous gland tissue.

FIG. 3.—Photomicrograph of section through surface of tumor at right angles to its base, showing stratified epithelium and hair follicles. (Watson's $\frac{1}{2}$ inch objective and C ocular.)

MICROSCOPIC CHANGES IN EXPERIMENTAL CONCUSSION OF THE RETINA.

By Dr. R. DENIG.

RESIDENT ASSISTANT SURGEON NEW YORK OPHTHALMIC AND AURAL INSTITUTE.

(*With colored Plate I. of Vol. XXXIV. Germ. Ed.*)

THE white color of the retina, following the so-called commotio retinæ, was believed to be an œdema of the retina, caused by subchoroidal hemorrhages from ruptures of the choroid. I had the opportunity of observing, in experiments made on rabbits, the ophthalmoscopic picture of *subchoroidal* hemorrhages, in which I found quite a different condition from that of the so-called commotio retinæ. In subchoroidal hemorrhages a grayish-white discoloration, as if located in the deeper layers of the retina, is observed, particularly at the margins of the hemorrhage, while in commotio retinæ the discoloration is milky-white, as if located upon the surface of the retina.

The anatomical conditions, therefore, do not consist of subchoroidal hemorrhages and retinal œdema, but present typical changes in the nerve-fibre layer of the retina as follows (see Plate I.):

Corresponding to the ophthalmoscopic picture there are many small elevations in the nerve-fibre layer of the retina, strung like pearls, with alternating depressions. The thickness of the elevations is about one-tenth to one-third the diameter of the retina, the length being from three to five times the thickness. The elevations are covered by the membrana limitans, and the latter is torn at places. The ganglion cells are here displaced somewhat farther back.

The nerve-fibre layer between the elevations is slightly thickened, which is also noticed at the transition from the elevations into normal retina.

With a high magnifying power the elevations of the retina have the appearance of mushrooms, with irregularly formed openings of various sizes, strongly reflecting the light, with a yellowish opalescence. The framework took the stain, but the cavities did not.

The other layers of the retina are normal, containing between the rods and cones some spheroidal structures as exudations from the vessels of the choroid; the latter, immediately (for about thirty seconds) after the blow, become paralyzed and dilated with simultaneous hyperæmia of the optic disc; this condition could be very well observed in albino rabbits.

Subchoroidal hemorrhages are caused only by very severe blows. I have still to add, that I found the elevations and the exudation in the retina between the rods and cones, even when the discoloration of the retina was not noticed with the ophthalmoscope. If one may draw conclusions from the rabbit's eye to the human eye, it can be easily understood why, in some instances of commotio retinæ, there exists, despite a normal fundus, a diminution of peripheral and central vision in the form of a scotoma or impairment of sight.

As to the explanation of the changes in the retina, *I believe that the blow causes the vitreous to impinge upon the retina like a wave, rebounding with the same violence toward the starting-point; the same changes are, therefore, mostly observed at that latter spot.* Through the violence of the wave of the vitreous, the stigmata of Müller's fibres are distended, in some places the limitans is torn and vitreous humor is forced into the nerve-fibre layer of the retina. The latter being broken up gives rise to the above microscopic picture, and produces, if large enough, the ophthalmoscopic picture of the milky discoloration of the retina.

The vitreous humor, pressed inward, becomes gradually absorbed again, the broken-up nerve fibres unite again, and all structures return to the normal.

The fact that no harm to the nerve fibres was done, may be explained by the well known resistance of the axial cylinders, for instance, in multiple sclerosis.

BACTERIA IN THE NORMAL CONJUNCTIVA AND THE EFFECT UPON THEM OF ASEPTIC AND ANTISEPTIC IRRIGATIONS. THE STAPHYLOCOCCUS EPIDERMIDIS ALBUS (WELCH) A REGULAR INHABITANT OF THE NORMAL CONJUNCTIVA.

By ROBERT L. RANDOLPH, M.D., Baltimore, Md.

THE works of Leber, Sattler, Gifford, Gayet, Marthen, Bernheim, and others upon the bacteria of the conjunctiva are practically in accord in the opinion that the normal conjunctival sac always contains bacteria in larger or smaller number. Gelpke[1] recently expressed the opinion that all strictly normal conjunctivæ are possibly sterile, but he based this assumption upon a very limited number of observations, and even from his own figures one would be hardly warranted in drawing such a conclusion.

I recently made a series of experiments upon one hundred individuals. These one hundred persons comprised patients (not eye patients) in the dispensary and wards of the hospital, medical students, and nurses. In every instance it was objectively and subjectively clear that the conjunctiva was normal. The inoculations were upon nutrient agar, and usually "smear cultures" were made. A platinum loop, sterilized by holding it in a flame, was rubbed over the lower part of the conjunctival sac. The patient was then required to look down, and the loop was carried well up into the upper part of the sac, and finally rubbed gently over portions of the bulbar conjunctiva. I will say here that it is hardly possible, certainly not practicable, to touch every part of the conjunctiva. I doubt whether in any of these cases the

[1] *Graefe's Archiv f. Ophthal.*, Bd. xlii., 97.

platinum loop came in contact with more than half the conjunctival surface, and yet out of the one hundred experiments there were only thirteen sterile tubes. If then, inoculations from a limited area of the conjunctiva show the presence of bacteria in eighty-seven out of one hundred cases, it is more than probable that inoculations from the entire conjunctiva would show the invariable presence of bacteria.

In conducting experiments of this character, one must avoid touching either the free border of the lids or the eyelashes. This mishap will occur whenever the patient winks, and it necessitates a repetition of the experiment. It will be observed that in eighty-five out of the eighty-seven cases where bacteria were found the latter resembled each other morphologically. A whitish growth would generally appear on the agar, about thirty-six or forty-eight hours after the tubes were placed in the thermostat. In some cases this whitish growth assumed later a yellowish tinge. Under the microscope, however, there was no apparent difference in the shape and size of the organism which resembled the staphylococcus pyogenes albus.

In surgery two methods are usually employed to sterilize the field of operation; either the aseptic method, by which bacteria are removed by mechanical means (as, for instance, the irrigation of a given point with water which has been sterilized by heat), or the antiseptic method, consisting in the employment of chemicals which have the effect of either destroying bacteria, or of inhibiting their growth. Both methods were tested in two series of fifty experiments each.

First the aseptic method: Inoculations were made from fifty individuals with normal conjunctivæ. After this the conjunctivæ were irrigated three times (with an interval of five minutes between each irrigation) with water which had been sterilized by boiling, and inoculations were again made from them into agar. There was a growth in forty of the tubes representing inoculations before the employment of the aseptic irrigation. The other ten tubes were sterile, and hence are not counted in the results. After the aseptic irri-

gations there was a growth in thirty-two tubes, that is to say, the apparent effect of the aseptic method was to produce sterility of the conjunctiva in eight cases out of forty. It may be added that a number of control experiments showed that the water used for irrigation was sterile. It is evident from this that we cannot rely upon aseptic irrigations of the conjunctiva to produce sterility of the surface of this membrane.

Another series of fifty experiments was made. Just as in the foregoing series inoculations were first made to see if there were bacteria in the conjunctivæ, and immediately afterward these conjunctivæ were flooded with a sublimate solution, 1:5000. Five minutes later inoculations were again made from them. Before the use of the sublimate, forty-two tubes presented growth and eight were sterile. These eight are excluded. In the forty-two cases, however, where there was a growth before the instillation of the sublimate, there were nine sterile tubes after the use of this solution. It will be noted that in this last series a staphylococcus was almost invariably found just as in the first two series, and I have been surprised to find how seldom any other form of bacteria than micrococci were observed. In the first series (of one hundred) a bacillus was found in two cases. In the second series (of fifty) a bacillus was seen in one case only, and in the third series of fifty cases a bacillus occurred once.

The micrococcus which was found with such regularity in my experiments is doubtless identical with the one mentioned by Bach, Morax, and others as frequently present in the normal conjunctival sac. This coccus I have found to present the following properties: Morphologically it is indistinguishable from the pyogenic staphylococci. It stains by Gram's method. It liquefies gelatine, but does so more slowly than the staphylococcus pyogenes aureus. It grows upon ordinary culture media, the color of the growth remaining white upon potato and other media. It coagulates milk more slowly than the ordinary yellow pyogenic coccus. 0.5 to 1 *cc* injected into the ear-vein of a rabbit produced no effect. These characters suffice to identify the staphylococcus epidermidis albus described by Welch as a regular

inhabitant of the epidermis and hair follicles, where it lies more deeply than can be reached by ordinary methods of disinfection of the skin.[1] As pointed out by Welch, this coccus is to be regarded probably as a variety of the staphylococcus pyogenes albus. It grows somewhat more slowly, liquefies gelatine, and coagulates milk more slowly and is less pathogenic for man and animals than the ordinary staphylococcus pyogenes albus as found in inflammatory lesions.

It is of no little interest that this regular inhabitant of the epidermis is now identified as likewise a regular inhabitant of the conjunctival sac. It can be readily understood how an organism that lives regularly in the epidermis and hair follicles should gain ready access from the neighboring parts to the conjunctival sac. We can likewise comprehend that an organism, such as this skin coccus, which has habituated itself to the conditions of life in the epidermis, should survive in the conjunctiva. Doubtless all sorts of bacteria must at times gain access to the conjunctiva, but few of these find conditions for prolonged survival there. It is only this white skin coccus which is found with such frequency in the conjunctival sac that it can properly be regarded as a regular inhabitant of this situation.

As pointed out by Welch, this skin coccus is usually a harmless invader of wounds, being found with great frequency in so-called aseptic wounds, which heal by primary union. Various accessory or predisposing causes, such as the presence of foreign bodies, of necrotic and strangulated tissue, impaired vitality of the part, may, however, permit the limited pathogenic powers of this coccus to manifest themselves. Under these circumstances this coccus may cause inflammation, even of a suppurative character, and interfere with wound-healing. Doubtless the conditions as to the pathogenic properties of this coccus as regards the eye do not differ from those relating to the skin. Ordinarily its presence is of little or no significance, exceptionally it

[1] Welch, "Conditions Underlying the Infection of Wounds," *Trans. of the Congress of American Physicians and Surgeons*, Second Triennial Session, Sept., 1891, vol. ii.

may cause inflammation and interfere with the healing of wounds.

In the last twenty-five cases in which this organism was found, it was subjected to the following test: The end of the platinum loop, after being thoroughly rubbed over the growth, was immersed in a solution of sublimate 1:5000, and allowed to remain there for five minutes. The loop was then withdrawn and plunged into agar, and in every case there was a luxuriant growth, a result which showed that the chemical disinfectant as thus applied had apparently no effect upon the vitality of the organisms. This cannot be regarded as a delicate test, for it is possible that the sublimate did not penetrate the entire mass of organisms. It did not, however, seem necessary to carry out further this line of experiment, for this white coccus is certainly not more susceptible to disinfectants than the staphylococcus pyogenes aureus, as is clear from the experiments of Robb and Ghriskey and of Sherwood.[1] Abbott[2] has shown the uncertainty of securing efficient disinfection by sublimate solutions in careful tests with the staphylococcus pyogenes aureus.

The results, however, in this last series are not surprising when we consider how profoundly shaken is the position which sublimate once held as a germicide. The experiments in this connection of Geppert, Behring, Abbott, and others are well known and need not be quoted in detail. It suffices to say that these observers showed that the early experiments of Koch as to the potency of sublimate as a germicide contained a fatal flaw. Trousseau[3] found that after disinfecting the conjunctiva with sublimate solution 1:2000, or with a solution of cyanide of mercury 1:1500, the conjunctiva remained contaminated with bacteria.

Both aseptic and antiseptic methods in my hands led to practically the same results, for by neither method was sterility of the conjunctiva secured.

I have frequently observed that persons complain of a

[1] *The Johns Hopkins Hospital Reports*, vol. iii., p. 359.

[2] *The Johns Hopkins Hospital Bulletin*, vol. ii., p. 50, April, 1891.

[3] "Étude sur l'Antisepsie Oculaire," *Ann. d'Oculistique*, T. cxi., p. 433.

biting sensation in the eyes after the instillation of a sublimate solution, and in my experiments hyperæmia of the conjunctiva was produced a number of times. I am therefore inclined to think, in spite of what Franke [1] has recently said on this point, that such solutions are more or less irritating in their effect on the conjunctiva. The most that can be said in favor of the use of such a solution is that it may actually kill some of the more superficial bacteria, and may perhaps deprive others of some of their virulence, in other words, render them less pathogenic. It is more than probable that many of the conjunctival bacteria are so firmly attached or embedded in the conjunctiva as to be beyond the reach of either the aseptic or of the antiseptic method as practised by ophthalmologists, and nothing but the most vigorous scrubbing would produce asepsis. This is certainly the case with skin bacteria, as has been demonstrated by the experiments of Robb and Ghriskey.

Krönig and Menge [2] have shown that the vagina possesses a natural immunity from infection, and that this natural immunity or natural resisting power is invariably impaired by antiseptic irrigations. I believe that some such safeguard surrounds the conjunctiva, and that this membrane possesses in its cells and fluids anti-bacterial properties calculated to withstand successfully infection, or else it would be impossible to explain the relative freedom from disaster after operations upon the eye, especially after those which were performed in the days when no precautions were taken to avoid infection. The experiments reported here show that so far as the conjunctiva is concerned, little reliance can be placed upon the usual methods employed by ophthalmologists for obtaining asepsis.

In the clinic, which after all is the supreme court where these questions are finally adjusted, we are every day getting proof which points to the existence in every part of the body of a natural power of resistance to, or recuperation from, the action of pathogenic bacteria, and I think that ophthalmologists can bear witness to the fact that the eye must possess

[1] *Graefe's Arch. für Ophthal.*, Bd. xliii.
[2] *Deutsch. med. Wochenschr.*, N. 43, 45, 48.

this quality in a high degree. This being the case it is clear that these natural powers should not be weakened, and that we should avoid the use of agents which irritate and which may diminish the natural resisting powers of the tissues. The objections which have been rightly and widely urged against the antiseptic method as applied to the eye hold good in a measure for the aseptic method.

To abandon our attempts to disinfect the conjunctiva may seem a step backward, and there are not a few no doubt who attribute some of their success in cataract operations to having flooded the conjunctival sac with sublimate solutions. The fact that pathogenic bacteria are occasionally found in the normal conjunctiva is not a strange thing when we consider how often this class of bacteria is found in exposed parts of the body, which are clinically speaking normal. And why is it that the conjunctiva remains normal though it may contain pathogenic organisms? In a measure because the organisms are usually present in small number, and because it is not likely that they remain long in the normal conjunctiva. It has been shown that when large quantities of pyogenic bacteria are introduced into the normal vagina, they disappear from this locality in a few hours, and it is likely that the conditions in the normal conjunctiva are in a similar manner adverse to the prolonged survival of this family of organisms. But let the integrity of the conjunctiva be lowered (as for instance by an irritant), or, in other words, let the balance of power be disturbed in favor of the bacteria, and at once they break through and destroy.

We handicap the eye in its fight with the enemy whenever we make the corneal section, and we try to compensate for this disadvantage by employing a germicide. Now sublimate stands high as a germicide, but, unfortunately, on account of its irritating qualities it cannot be used in the eye except in a very weak form, and when so diluted it has been clearly shown to have lost much of its germicidal value, especially under conditions present in or on the animal body, and, furthermore, to have not been deprived entirely of its irritating properties. The fact that a successful operator has made it a habit to irrigate the conjunctiva with a sub-

limate solution whenever operating upon the eyeball does not in the least indicate that the sublimate contributed to success. Evidence is constantly multiplying to show that sublimate is an ineffectual germicide in the living body in the form in which we use it in the conjunctiva, and all that the successful operator can say is that the sublimate apparently did no harm. Even in pre-antiseptic times cataract operations were usually successful, and this cannot be attributed entirely to the skill of the operator. The increased success which we have enjoyed since the advent of antiseptic surgery through Lister must be traced, not to our having actually succeeded in disinfecting the conjunctiva, but rather to a right understanding of all that the principles of antiseptic or aseptic technique mean as applied to operations upon the eye, namely, sterile cocaine, sterile atropine, sterile hands, and, the greatest of all, sterile instruments.

Conclusions.—(1) The normal conjunctiva always contains bacteria. Of these the staphylococcus epidermidis albus is found with such frequency that it must be regarded as a regular inhabitant of this situation. This coccus and probably other bacteria found in this locality are usually of only slight if any pathogenic power. It should be remembered, though, that bacteria, ordinarily non-pathogenic, may become harmful under certain favoring conditions, such as the bruising of the tissues by instruments or the irritation resulting from chemical substances.

(2) Neither the irrigation with sterilized water nor the instillation of a sublimate solution (1 : 5000) produces sterility of the conjunctiva, and inasmuch as both measures are futile and possibly harmful they may just as well be abandoned. These methods of sterilizing the conjunctiva are the ones usually employed by ophthalmologists, and hence the choice of them for testing this question.

The most important essential of a germicide which is to be used upon the conjunctiva is that it be absolutely free of irritating properties, and, furthermore, it should be demonstrable that this germicide will destroy the germs most commonly met with in the normal conjunctiva. It goes without saying that an antiseptic which has these qualities would be indispensable in all operations on the eye.

(3) In operating upon the normal conjunctiva, as in cataract operations, the surgeon in the present state of our disinfecting armamentarium would do well to consider the subject of antisepsis and asepsis chiefly, if not solely, in connection with the hands, instruments, cocaine, and atropine.

A FURTHER CASE OF ANGIOID STRIÆ IN THE FUNDUS.

By JOHN DUNN, M.D., Richmond, Va.

(*With two figures on colored Plate XIV. of Vol. XXXIV. Germ. Ed.*)

Drawings by John W. Brodnax, M.D., Manchester, Va.

Mrs. P., aged thirty-two, seen first April 22d, 1896. In October, 1895, patient had, according to her physician, iritis, of which no traces remain. No specific history obtainable, nor does the physician, who has attended her for many years, think she has ever had syphilis. Urine normal. She had, however, received treatment for rheumatism. About the first of March, 1896, patient noticed that, when reading, a cloud would "come before" her eyes. V, April 22d, O. D. $= \frac{20}{100}$; with + 1 D sph. $= \frac{14}{60}$. O. S. V $= \frac{20}{60}$. No improvement with glasses. No pain about the eyes. Conjunctiva, cornea, iris, ciliary region, lens, vitreous, and field of vision normal. Eyes are abnormally sensitive to light, requiring the use of dark glasses. Examination of the fundus reveals a condition of the retina new to me. The blood-vessels, save some dilatation of the veins, O. D. and O. S., are normal; so is to all appearances the retina except for the areas to be described. The optic disc shows perhaps some paleness. The outlines of the discs are not sharply defined. Extending from the margin of the disc, O. D. and O. S., are streaks, as shown in the cuts, of varying widths and lengths. The outlines of these streaks are more or less well marked but irregular. They have their greatest width, as a rule, next the disc, while at their extremities they appear very narrow and resemble at first glance rents in the retina. These streaks pass everywhere beneath the retinal vessels, which they cross in such a manner as to prove that they have no connection with the vessels. In several places, for varying lengths, the streaks at first glance appear to be the seat of hemorrhages; careful focussing, however, shows the red color to be the choroidal

vessels passing beneath these areas—e. g., O, O′, O″, O. D. In the neighborhood of the disc these streaks anastomose to a greater or less extent. In two places, *a*, O. S., and *b*, O. D., the appearances presented suggest the idea that at these places the inflammation was severe enough to pass beyond the straight track and to cause slight hemorrhages. In two other places, *x*, O. D., and *x*, O. S., there are isolated patches resembling in color and appearance the streaks.

The color of the streaks is a light gray or leaden, save where the retinal pigment has been sufficiently destroyed for the underlying choroidal vessels to show through. In O. S., external to the macula, exists an irregularly circular area, about 2 o. d. in area, where the retinal pigment has been disturbed and gives the appearance sometimes seen in cases of commotio retinæ. The patient was put upon syphilitic treatment to which pilocarpine was added.

May 18th. V. O. D. = $\frac{1}{10}$. O. S. $\frac{5}{10}$.

June 8th. V. O. D. = $\frac{1}{15}$. O. S. $\frac{1}{15}$.

There have, however, been no visible changes in the appearances seen in the fundus. Marked diminution of the retinal hyperæsthesia.

May, 1897. Eyes as they were in June. No further addition to the streaks.

In considering the appearances above described mention must be made of the case reported by PLANGE (ARCH. OF OPHTH., vol. xxi., p. 282); of the articles by KNAPP (ARCH. OF OPHTH., vol. xxi.); by STEVENSON (*Trans. of Ophth. Soc. of United Kingdom*, vol. xii., p. 140, 1892); by HOLDEN (ARCH. OF OPHTH., vol. xxiv., p. 147); by WALSER (ARCH. OF OPHTH., vol. xxv., p. 363); by FRETORI (*Deutschmann's Beiträge z. Aughk.*, No. 24, p. 101); and, lastly, those by DE SCHWEINITZ (*Amer. Ophth. Soc. Trans.*, 1896) and (*Oph. Record*, July, 1897). Plange's explanation is that these appearances are to be referred to a "deposition of pigment in striæ in the retina after hemorrhage, followed by changes—probably hyperplastic—in the supporting fibres of Müller." Knapp strongly insists upon the hemorrhagic origin of these striæ. That this is undoubtedly true is later clearly proven by the case reported by De Schweinitz. There are several points to be noted in the case given above. In the first place, where these streaks and

the retinal vessels cross each other, the vessel, in every instance, lies above the streak, and is nowhere surrounded by an exudate. The streaks do not follow the lines of the vessels, but cross them in every direction; furthermore, they take their origin from the edge of the disc, whence they travel towards the periphery. Entirely surrounding both discs is an irregular band, in color and appearance identical with the streaks, and it is from this band that the striations all proceed. In several places about the disc they anastomose, as do also, in one or two places, the projections from the main streaks. That these appearances are inflammatory in origin is without question, it would seem; the proof is afforded by the changes seen at *k*., O. S.; by the isolated gray patches seen at *x*, *x*, O. D. and O. S.; and by the presence of the slight hemorrhages seen along the borders of the areas *a*, O. S., and *b*, O. D. It is further to be noted that in color these striations are neither brown, dark brown, black, nor white, but are of an almost uniform gray or lead color. There are nowhere to be seen the "glistening stripes" mentioned by Plange, nor has there, as yet, developed any "whitish fringe." The picture presented by the fundus in April, 1896, is practically unchanged in May, 1897, showing how slowly visible changes occur after the absorption of the hemorrhages. De Schweinitz's case, seen in the stage where the hemorrhages are still visible, and watched for more than a year, proves that these angioid streaks follow retinal hemorrhages. The variations in number, in width, in position, and color of these streaks depend upon the extent of the hemorrhages, their duration, and the general condition of the patient. As to why the result of retinal hemorrhages should be the formation of these peculiar streaks, aptly called angioid, we can offer no better explanation than that given by Knapp, namely, that "after a hemorrhage the blood corpuscles lie more or less loose in the retina, and are by the tissue currents collected in lines or irregular figures, such as we see in the sand at the seashore" (*Trans. Am. Ophth. Soc.*, 1896, p. 660). De Schweinitz's case shows that the shapes of the original hemorrhages correspond, in some instances, very closely to the subsequently developed streaks.

KERATITIS VARIOLOSA.

By Dr. C. E. FINLAY of Havana, Cuba.

DURING the severe smallpox epidemic which was so alarmingly prevalent here, in Havana, last autumn and winter, I had the opportunity of observing several of the ocular complications of this loathsome disease. By far the most common was a keratitis distinguished by certain characteristics in its appearance and in its course, of which I saw twenty-four cases. As I would never have formed a correct idea of the affection from the descriptions which I have found in the text-books and monographs—both older and more recent—that I have been able to consult, I venture to submit my observations to the ophthalmological public, hoping that they may prove interesting and to some even useful.

The usual time for the appearance of this complication is between the end of the second and the end of the third week of the disease, after desiccation has commenced; occasionally it occurs earlier, at times not till after convalescence is fully established. At this, its earliest stage, one finds at a point in the cornea, somewhere between its centre and the margin, an irregularly square-shaped patch, from 1 to 2 *mm* square (even when involving the centre of the cornea its situation is apt to be ex-centric). The appearance of this patch is most striking and characteristic. The greater part of its area is transparent, though distinctly differentiated from the remainder of the cornea by oblique illumination with accurate focusing, and gives one the impression of a more or less large drop of fluid contained in the substance of the cornea. The edge nearest the corneal margin, however, stands out

prominently, showing a deep milky-white infiltration. The epithelium over all this area is intact. At this stage one also finds moderate ciliary injection and marked photophobia, blepharospasm, and lachrymation.

Most gradually the marginal infiltration extends over the remainder of the patch till the whole presents a uniform milky-white or yellowish color; occasionally, however, the edges show a deep infiltration throughout the whole course. Whilst this is going on, a partial or total desquamation of the epithelium covering the infiltrated area takes place. Ciliary injection is of course more marked. During this period the subjective symptoms also become more prominent, the blepharospasm, photophobia, and lachrymation are more intense; ciliary neuralgia, especially at night, is the source of much suffering and discomfort; the severity of these symptoms is usually in proportion to that of the local lesion. Seldom is there any accompanying iritis. Hypopyon at times is present; it was so in six of my twenty-four cases; in none did spontaneous perforation occur. I saw, however, a case of panophthalmitis with corneal sloughing which, from the history, seems to have originated in a keratitis of this nature which had been grossly neglected.

After lasting for a longer or shorter time, the objective and subjective symptoms slowly commence to recede, the infiltrated area gradually becoming vascularized. This vascularization in its turn diminishes, and finally a more or less dense leucoma results; the consequent interference with vision depending on its position, size, and density. It clears up somewhat during the succeeding months. The blepharospasm and photophobia persist for a long time, diminishing gradually in intensity.

The *duration* of the disease seems interminable; the cases drag on for a long time after convalescence is fully established, and are a sore trial for the patience of both patients and oculists; few last less than three or four months.

The *prognosis* as regards the integrity of the eyeball is good; in none of my cases was the eye lost. The remaining deficiency in vision depends on the leucoma, and may be corrigible at a later period by an iridectomy, if not too extensive.

Treatment seems to have little or no influence on the duration of the affection. The one I followed was mostly palliative and directed towards avoiding complications. It consisted mainly in cold or hot boric acid compresses, frequently renewed, and in frequent instillations of bichloride of mercury (1 : 6000) and atropine ($\frac{1}{2}$ per cent.) drops. Where there was much blepharospasm and photophobia I used yellow ointment, often continued, with cocaine. During the vascularization stage I derived some benefit from the dusting in of calomel. The ciliary neuralgia I controlled with antipyrin and phenacetin. I several times cauterized (with a red-hot probe) the infiltrated margin or even the whole patch (where not too large), but never obtained the slightest benefit, either as regards the intensity of the symptoms or as regards the duration of the affection, from the operation. In two cases with hypopyon where suppuration of the globe seemed imminent, and in which I made a Saemisch section, this was averted, and the duration of the inflammation as compared with other cases was notably shortened; but in one with no hypopyon where I performed a similar operation, this had no appreciable influence on the subsequent course. In two other cases with hypopyon I opened an abscess of the cornea with a Graefe knife without going through the cornea,[1] letting out a puriform exudate contained in its substance, with beneficial results as regards the hypopyon. In these two cases the posterior layers of the cornea were found perfectly transparent (perforation afterwards was spontaneously completed). Two other hypopyon cases got well without operative interference, in one suppuration of the globe appeared to threaten, and the operation on being proposed was refused by the patient.

As regards the *nature* of the affection, it is very difficult to form a correct opinion, not having had an opportunity of examining any of these eyes anatomically. The stage of the disease at which it makes its appearance seems to preclude the lesion being considered as a variolous pustule and

[1] The first time this occurred accidentally; I had intended making a Saemisch when a sudden movement on the part of the patient's head made the knife cut through the superficial layers of the cornea without going through it, thus laying the abscess open.

would incline one towards a secondary infection direct or metastatic. On the other hand, the impression made on me was decidedly that of a vesicle contained in the substance of the cornea, the contents of which at first being transparent gradually became opaque, and if not evacuated became more and more inspissated, finally organizing into more or less dense cicatricial connective tissue. The long course of the affection also seems to go hand in hand with that of the skin pox-marks which remain discolored for so many subsequent months. I am rather inclined to consider the lesion as a variolous pustule which in the cornea, for some reason or other, appears at a later period than in other tissues.

PARTIAL EMBOLISM OF THE CENTRAL ARTERY OF THE RETINA.

By C. F. CLARK, M.D., of Columbus, O.

AS is well known, the first instance in which a correct diagnosis of embolism of the central artery of the retina was made by the use of the ophthalmoscope was the classical case seen by that pioneer in modern ophthalmology, A. Von Gräfe, in 1858, and described by Schweigger a few years later.

While there is a general agreement among ophthalmologists as to the phenomena of complete embolic obstruction of the central artery, the relatively rare instances in which a portion of the retina has retained its vascular supply and continued to perform its functions have been the subject of some differences of opinion among careful observers, and this fact would seem to warrant us in bringing to the attention of the profession such cases as may come within the range of our experience.

Case I.—**Embolism of the central retinal artery, with preservation of the papillo-macular area.**

On January 12, 1896, I was consulted by Mrs. C. E., age fifty-one, who was referred to me by her physician, Dr. Barcroft, of Coshocton, Ohio, on account of the condition of her left eye. She had known of no defect in her vision until nine days before the above date, when suddenly, while sweeping, she noticed what she described as a "glimmering" before the left eye and in a few moments the whole visual field clouded over with the exception of a small space near the centre.

Although not robust, her general health had been good with the exception of one severe attack of malarial fever from which she suffered some twenty years before, and occasional mild attacks

of the same disease in the spring and fall. She knew of no cause to which she could attribute the disease of the eye.

Her vision was R E $\frac{6}{9}$ — L E $\frac{6}{30}$ — seen only within a limited area near the disc, and with this eye she could, by the aid of a + 4 D sph. glass, read with difficulty Jaeger 9. The pupillary reaction could not be determined as she had used atropine a few days before. In the right eye the visual field was apparently normal, while in the *left it was irregularly elliptical and extended only from the blind spot to the point of fixation.* At a distance of one foot it measured in its vertical diameter two inches and horizontally three inches.

On examination with the ophthalmoscope it was found that the field of vision corresponded to the papillo-macular area which was normal in color in the midst of a whitish, œdematous zone surrounding the disc. The macula, while not like that of typical, complete embolism of the central artery, presented a marked contrast to the surrounding pale retina, and formed the apex of an irregularly triangular island of normal tissue, the base of which was formed in part by the disc. The upper and lower borders of the triangle were formed by vessels, the lower of which seemed to be a vein while the character of the upper one was difficult to determine, though it was probably of the same nature. Both this upper vessel and a smaller one which extended some distance into the centre of the normal area appeared to emerge from the disc at some distance from the central vessels and they could therefore be said to have their origin possibly behind the situation of the embolus. *A superficial hemorrhage* of considerable size was observed near the margin of the disc about the upper vessel above mentioned and a small one on the vessel supplying the central portion of the triangle. The larger veins of the retina, especially the inferior, were somewhat distended while the arteries were all quite narrow.

No vessel of the so-called "cilio-retinal" variety could be made out and, indeed, there was ample nutrition supplied to the normal area by other vessels without resorting to the assumption of the existence of such a supply.

Case II.—Embolism of central retinal artery, with preservation of the papillo-macular area.

Mrs. J. W. M., age thirty-four, was referred to me by Dr. Buckingham of Springfield, Ohio, on August 18, 1896, with the following history:

While walking on the street in the evening of the 15th, three days before her visit to me, she had a fall which, however, seemed to her of no significance, as she caught herself with her hands and did not strike her head, but on awaking the next morning she found that the vision in her left eye was very defective and the field greatly limited. No cause other than the fall could be discovered as her general health had been good.

A physical examination by Dr. Rogers revealed a *slight, soft, diastolic murmur* along the left side of the sternum, heard with maximum intensity in the fourth intercostal space four inches from the median line and as far to the left as the axilla.

The general appearance of the eyes was normal, the pupils responded to light, and there was no discomfort excepting that caused by the defective vision and limited field of the left eye.

The vision of the right eye was $\frac{6}{6}$ and she read J 1 at $5'' - 14''$. In the left the vision was $\frac{5}{12}$, and the field, which was difficult to measure, seemed to take the form of an *irregular, acute-angled triangle*, the apex of which was at a somewhat eccentric point of imperfect fixation, the centre corresponding approximately to the normal point of fixation, and the base to the temporal side. Outside of this area there was absolute blindness. The portion of retina therefore which retained imperfect vision extended in the form of an irregular triangle from a point near enough to the macula to give vision of $\frac{5}{12}$, to the disc and beyond it in a somewhat irregular zone into the nasal quadrant.

This corresponded approximately with what was seen with the ophthalmoscope, namely, that while there was slight, general œdema of the retina, an irregular, horizontal zone, including the disc and extending toward both the nasal and temporal sides and increasing in width both to the right and left of the disc, was fairly clear. Two vessels, apparently of somewhat deep origin, extended from the disc near its centre to the inferior temporal quadrant of the retina, the upper one of which seemed to pass just beneath the macula and formed a rather sharp outline to the grayish œdema which was to be seen in the lower portion and to a less degree in the upper portion of the retina. A small, well defined, independent vessel of deep origin could also be seen on the opposite side of the disc extending into the nasal quadrant.

The patient continued to enjoy vision of $\frac{5}{12}$ with the same visual field for more than three months, when her baby accidentally struck her in the left eye with a child's bow which, without causing pain or other evidence of traumatism, instantly deprived

her of this power and produced a long, narrow, cloudy scotoma in what had been the best portion of her narrow, triangular visual field.

On April 16th, 1897, when I saw her last, she could with difficulty count fingers at a distance of one or two feet when held so that the image should fall in the nasal portion of the limited field.

The patient, who is an intelligent observer of her own symptoms, drew a diagram to indicate the form of the scotoma which made its appearance after her recent injury, and it corresponds to what might be expected were an embolus to find lodgement or a thrombus to be formed in the small macular artery mentioned above.

Case III.—Embolism of superior branch of central retinal artery.

On August 1, 1893, I was consulted by Mr. A. D. S., a botanist, thirty-three years of age, of good habits and good general health, who gave me the following history:

While camping he awoke on the morning of the day before his visit to me with the sensation of a veil over the right eye, and with vision defective in the lower portion of the field. He thought the visual field had increased since the accident, but while a rough test revealed a normal outline for the left eye, in the right there was blindness below a horizontal line through, or a little above, the centre of the field.

He stated that for three or four weeks he had been somewhat indisposed, complaining of pain in the chest. About sixteen months before he had grippe, followed by rheumatism, which did not, however, assume the acute inflammatory form. At one time, while suffering from grippe, he fainted and fell from his chair. As the result of a physical examination made by Dr. Rankin, it was determined that he had a slight cardiac murmur due to roughening, which was the result of endocarditis, and, as there was a tendency to recurrence of the rheumatic symptoms, he received appropriate treatment.

Vision and field in the left eye were normal. In the right eye the lower half of the visual field was defective, but the superior half was normal, as was also his central vision when tested at a distance. But on attempting to read he was hindered somewhat by the limitation of the visual field, which made it difficult for him to find quickly the line beneath the one upon which his attention had been fixed.

The general appearance of the eyes was normal, and he complained of no pain.

The ophthalmoscopic appearance of the left eye was normal, but in the right was seen a most striking picture. The lower half of the retina presented the usual appearance, while the upper half was white and œdematous. The lower border of this area of œdema was clearly defined, and it extended farther to the temporal than to the nasal side. Above, it did not seem to extend to the extreme periphery.

The arteries were a little smaller than usual, and at the point of bifurcation above and near the disc there was a slight interruption of the light streak which should be seen in the centre of the artery.

The most important, and to me the most interesting, feature of the case was a short, slightly crescentic, red line lying above the apparently normal but well defined macula. This short crescent had its convexity upward, was approximately concentric with the macula, and seemed to correspond with, and, in fact, to be the upper segment of, the cherry-red spot seen in cases of embolism of the main trunk of the central artery. In other words, the sharply defined lower border of the œdematous area of the retina passed through the upper portion of the macula, and therefore it was only at this point that the contrast was noticeable.

On August 4th, three days later, the patient detected some improvement in his vision in the defective portion of the field. The superior and superior temporal portions of the disc still seemed slightly swollen. The region of the macula was more evenly red, and the concentric red spot above had disappeared. The outlines of the defective portion of the field of vision corresponded to those of the œdematous portion of the retina as seen with the ophthalmoscope.

On August 12th the superior portion of the retina had assumed a more pinkish tint, but was still far from normal, and there was no improvement in the visual field.

On October 5th, sixty-six days after the appearance of the embolism, Dr. Rankin reported that a few days before Mr. S. had an attack of dizziness, which he described as peculiar and not at all like that of ordinary vertigo, and his wife stated that he was for a few moments absolutely blind in the right eye. He told Dr. Rankin that, on turning his head to one side, he had a tendency to continue to turn it.

Notwithstanding the above symptoms and marked anæmia, he persisted in continuing his work in spite of my remonstrances.

On October 13th, he stated that the lower portion of letters seemed slightly indistinct, which is in keeping with the fact that the upper portion of the macula was affected, but this indistinctness was not sufficient to prevent him from having vision of $\frac{4}{4}$ in each eye improved by the correction of his hypermetropia and low degree of astigmatism to $\frac{4}{4}$, nor from reading Jæger 1.

The ophthalmoscope revealed some pallor of the optic disc, with slight indistinctness of outline at the upper border, indicating possibly very slight swelling. The superior retinal artery was somewhat diminished in size, and the light streak in its centre was very narrow, indicating marked diminution in its calibre.

The dense white of the superior half of the retina was at that time replaced by an almost imperceptible blush of opacity slightly masking the normal pink beneath it.

The field of vision had improved, and objects could be seen at a point 15° to 20° below the line of central vision.

In June, 1894, I found that the central vision had remained good, and that there had been decided improvement in the visual field. The light sense was imperfect, but present in the defective portion of the retina.

On the 18th of July, 1896, about three years after the embolism first made its appearance, a careful examination of this patient by Dr. Rogers still revealed normal central vision with a pale disc.

It seemed that there was atrophy of the superior fibres of the retina and of the nerve fibres of the upper portion of the disc. The vessels in the superior portion of the retina were small, and the retinal tissue was dull in appearance. In the upper portion of the visual field his vision was good. In a broad zone below the centre it was dull, while the lower portion was practically blind.

Whether or not in this case the preservation of vision in the macular region was due to the existence of a cilio-retinal vessel, is a question which might naturally arise, but I detected no such vessel, and Dr. Rogers assures me that in his recent examination he satisfied himself that none existed. Had there been such a supply, I do not think the œdema would have followed in so direct a line across the upper half of the macular region.

It is probable that there *never* was *complete* obstruction of the superior temporal artery, but the obstruction was sufficient to produce the sharply outlined area of œdema, which confined itself to the field of distribution of that vessel. In the macular area, however, the anastomosis of the smaller vessels with those of the inferior branch of the central artery was so complete as to preserve all, excepting its upper quadrant, from the temporary disturbance of function produced by the œdema. Had the obstruction ever involved the whole calibre of the artery, it is not probable that, on the one hand, the vision in the superior half of the retina would have been almost completely preserved, or, on the other, that the macula would have continued to perform its function so perfectly, even at the time when the œdema was most marked.

The fact that the œdema, which in the days immediately after the occurrence of embolism is usually found to correspond in a general way in its area of distribution with the area which remains blind, is merely an incident, and does not stand in a causative relation with the permanent blindness is, I think, demonstrated by this case. It will be remembered that this œdema did not extend to the periphery in the superior portion of the retina, while an examination at a later period revealed blindness of the extreme lower portion of the visual field, and the ophthalmoscope discovered evidences of atrophy of the retinal tissue of the corresponding region.

The lower portion of the upper half of the retina, on the other hand, which was the seat of the most marked œdema, recovered almost perfect vision.

One would conclude from this that, whatever may be the temporary effects on vision produced by œdema of the retina, the permanent effects in a case of embolism are produced by impairment of the nutrition of the nerve-fibre layer. If this occurs for only a limited period of time, as by cutting off the vascular supply, the nerve fibres do not seem to have power to recover their functional activity.

While the case I have just described is, so far as I can learn, unique in the fact that in it we had a crescentic or

partial, cherry-red spot in the macular region, Cases 1 and 2 are of more real interest as belonging to a group which for a number of years has attracted the attention of ophthalmologists owing to the belief on the part of many that, by means of what are termed "cilio-retinal" vessels, the papillo-macular region obtains a blood supply which is independent of the central retinal artery.

If the crozier-like vessels, which in many individuals are seen to emerge apparently from the temporal border of the optic disc at such a depth in the nerve tissue as to suggest their origin in the choroid and then curve upward and outward to be distributed to the papillo-macular portion of the retina, really belong to the choroidal system, and are not branches of the central retinal artery, we certainly should be able, with the evidence afforded by the microscope and the ophthalmoscope in the number of cases of embolism of the central retinal artery which have been recorded, to demonstrate that fact. And, if they are merely branches of the central artery which, having their origin at some depth in the nerve head, pass outward to its temporal sheath at a point behind the lamina cribrosa, and are then reflected toward its centre as they emerge, and thus take the form which gives the impression that they come from the choroid, we should also be able to demonstrate that fact. That the question is one of great importance is apparent when we consider the comparative frequency of the occurrence of such vessels, and the distinctive form which they assume.

De Schweinitz (*Diseases of the Eye*, ed. 1896, p. 113) states that "in a series of examinations Land and Barrett found this vessel present in 16.7, Veasey in 14.2, and the author [De Schweinitz] in 10.6 per cent." (It is possible that these observers may have included as "cilio-retinal" vessels all vessels of considerable size emerging from the disc at its temporal margin and distributed to the papillo-macular region.)

Dr. W. K. Rogers and the writer have for a few months made notes on this point in all ophthalmoscopic examinations. We distinguished between a vessel appearing near the margin of the disc and turning directly into the retina and one

which had its apparent origin beneath the scleral ring and, after being directed toward the centre, curved again toward the periphery. This latter, crozier-like vessel we classed as a "cilio-retinal" vessel, and in the examination of 310 eyes Dr. Rogers found it present in 8 per cent., while the writer, in 317 eyes, found it in 10 per cent. (Had all the independent vessels of deep origin been included, Dr. Rogers's percentage would have been 27.3, and the writer's 22.3.)

What anatomical proof have we that the so-called "cilio-retinal" vessels originate in the choroidal system?

In a somewhat extended search of the literature of the subject I have been able to find but one instance, that of Birnbacher (ARCHIVES OF OPHTHALMOLOGY, vol. xvi., p. 32), in which the claim that an anatomical examination has demonstrated the presence of such a vessel is supported by what appears to be strong evidence. A plate which accompanies the description of this case would certainly seem to make clear that in this instance at least such a vessel did have its origin in the choroid.[1] This was not, however, a case of embolism.

The ingenuity of the theory by which the occurrence of such an anastomosing or independent vascular branch from the choroidal system explains the preservation of the papillo-macular area of the retina when an embolism has obstructed the central artery seems to have had a peculiar charm for all who have written on the subject, and has led many observers to accept it without criticism, and whether or not such an anomalous vessel can be proven in any instance to have co-existed with the preservation of normal vision in this area, it is certain that in many instances writers who are generally careful observers have fallen into the error of adopting this explanation where the evidence is entirely insufficient.

Professor Laqueur (October, 1896, ARCH. OF OPH., vol. xxv., p. 525) gives abstracts of sixteen cases of embolism of the central artery with integrity of the temporal region of the retina which he states are all he could find recorded.

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[1] A similar drawing by Alt occurs in his *Histology*.—W. A. H.

In addition to these the editor of these ARCHIVES mentions three other cases which should be added, and I have found two more mentioned in medical journals, which seem to have been omitted. These, with the case described by Laqueur, and the two which I have described above, make a total of twenty-four.

In the literature at my command I have been able to obtain somewhat detailed accounts of sixteen of these twenty-four cases, and it may be pertinent to ask how far the results of a careful study of these clinical cases warrant us in concluding that true cilio-retinal vessels were the means of preserving the integrity of the papillo-macular region of the retina.

In answer to this question it may be interesting and, in view of the claims that have been repeatedly made in favor of this theory, it is certainly surprising, to note that in not one instance has the existence of what has been classed as a cilio-retinal vessel been demonstrated ophthalmoscopically. In not one was anatomical evidence adduced to prove that such a vessel was present, and while only four writers claimed the existence of a cilio-retinal vessel, three of these in the context made it apparent that they did not distinguish between a "cilio-retinal" vessel and a macular vessel of deep origin.

In conclusion I would say that beneath the statement of the time-honored theory that in embolism of the central artery a so-called cilio-retinal vessel serves to preserve the papillo-macular area by virtue of its origin in the choroidal system, we must write *not proven.*

A CLINICAL AND ANATOMICAL CONTRIBUTION TO THE SIMPLE OR SEROUS CYSTS OF THE CONJUNCTIVA.

By GIACOMO ROMBOLETTI, Pavia.

Translated by Dr. J. A. Spalding, Portland, Me.

(*With Plate I. from Vol. XXXI., German Edition.*)

EVERY contribution to this chapter of ophthalmological pathology, which is still small owing to the few cases observed and described, must be of interest, because the pathology of these structures, even in the latest text-book (Panas), has had but little light thrown upon it. Without intending to offer a detailed classification of conjunctival cysts, but simply to show the histology of a case of simple cyst observed in our clinic, I may divide these structures into four different sorts.

The *first* class of cysts embraces those which lie in the bulbar conjunctiva, and are largely congenital, though they occasionally develop as the patient grows. Saemisch[1] says that they often lie near the corneal margin, that their walls are delicate and thin, with scattered vessels, and with clear, watery contents. Generally they are not movable, from which we may conclude that the conjunctiva itself takes part in the formation of their walls. Amongst other writers, Wecker[2] speaks of a thick-walled cyst which is immovable, owing to its adhesions to the sclera, whilst Mackenzie[3] mentions those which are movable beneath the conjunctiva, showing no adhesions with the latter or with the sclera.

[1] *Graefe-Saemisch*, ix., pt. 1, p. 157.
[2] *Traité complet*, t. i., p. 425.
[3] French translation, 1855, t. i., p. 363.

The histology of this first sort of cyst is still unexplained, and Panas urges that they ought to be regarded as dermoid cysts rather than conjunctival, because of their thick walls and deep adhesions with the episcleral tissue.

The *second* sort of cysts is generally situated in the bulbar conjunctiva, shows the same morphology as the first species, and is chiefly of traumatic origin. The cases of this sort so far reported are not very numerous, and as chief amongst them we may refer to those observed by Uhthoff.[1] The first case which this observer saw was after an advancement of the rectus externus in a case of excessive convergent strabismus. Five weeks after the operation the patient observed a blister-like elevation 3 to 4 *mm* in height, at the insertion of the rectus externus, and about 4 *mm* from the corneal margin. The contents were purely serous and as clear as water. Anatomical examination showed the walls to consist of rather coarse fibrous connective tissue without any regular arrangement or stratification of the layers. The inner surface of the cyst was covered with a regular nucleated pavement-epithelium in one layer only. There was no foreign body, such as an eyelash, in the walls of the cyst or anywhere to be found in its contents.

Uhthoff's second case was due to a penetrating wound of the upper lid and ciliary region. Five weeks after, the unhealed cicatrix was closely examined, and on everting the upper eyelid two eyelashes were seen adherent in the incision. About 1 *cm* from the corneal limbus was a cyst the size of a bean, with the conjunctiva firmly adherent above it. The contents were serous and transparent, and on using focal illumination three eyelashes were seen to be imbedded in the walls of the cyst. During the operation for removal, the posterior wall of the cyst was found to be adherent to the sclera, and measuring 9 *mm* by 5 *mm*.

In all, five eyelashes were found imbedded in the walls, but only two with any degree of tenacity, the other three being loose and falling out during the manipulations. Of the two firm eyelashes, one lay imbedded its whole length in the wall, whilst the other was half imbedded and half

[1] *Berlin. klin. Wochensch.*, 1878, No. 49, p. 729.

free, like the stem of a pear. The insertion of the lashes in the cyst was marked with a minute papular prominence.

The author's examination showed a cystic wall of fibrous, nucleated connective tissue, but without any special structure or arrangement. The inside of the wall was lined with nucleated pavement-epithelium in one layer. The spot where the eyelash was inserted like a stem was proliferated into five or six layers.

The third cyst was discovered by the patient not long after an insect had flown into the eye. This cyst was elongated into a fine point at both ends and swollen in the middle. The anatomical investigation seemed to demonstrate a partially dilated lymphatic vessel in which, owing to the expansion of the walls, the characteristic structure of the vessel was lost.

Uhthoff, in his remarks about these cysts, emphasizes the brief duration of growth after the original injury, at the most only five weeks, and as the cyst was then large enough to be felt by the patient, its origin must be referred to as early a date as two weeks after the injury. In the third case the cyst had probably been present for some time, but was not observed by the patient until his attention was called to the eye by the slight injury from some insect.

The pathology of the second case proves clearly enough that the eyelashes were the exciting element. It is also possible that the hair follicle carried into the conjunctiva was the real cause of the origin of the cyst, as Rothmund has urged in the origin of pearl tumors of the iris.

Although structures composed only of epithelial cells may thus originate, we are not justified, according to Uhthoff, in transferring this mode of development to cysts with serous contents and connective-tissue walls. For, in pathological anatomy, there is no analogous occurrence, since, wherever such cysts have originated, they have always been retention cysts. Here there was nothing of the sort. The greatest probability is, that it was not the hair follicle implanted with the eyelashes themselves, but the latter alone, which acted as foreign bodies, produced inflammatory exudation in the surrounding tissues, and so gave rise to a cyst.

So far as the diagnosis is concerned, Uhthoff suggests that ordinary observation shows in most cases whether a conjunctival cyst has arisen from the dilatation of a lymphatic vessel or otherwise. Cysts which are due to partial dilatation of lymphatics lie, owing to their anatomical situation, in the superficial layers of the conjunctiva, are always movable upon the sclera, and we can generally follow from the end of the cysts the lymphatic vessel a little farther onward in the shape of a thin string. Traumatic cysts generally lie in the subconjunctival tissue, and owing to their deeper localization, and especially owing to the inflammatory reaction in their neighborhood, they are firmly attached to the sclera and to the overlying layer of conjunctiva, and consequently are but slightly movable over the latter tissue.

The *third* species of cysts includes those which generally develop on the bulbar conjunctiva as a result of the enlargement of the lymphatics of the mucosa, and, consequently, form a lymph-angioma of the conjunctiva. They are small, resembling rows of pearls or transparent worms, and lie on the surface of the mucosa.

These cysts were carefully investigated by Hirschberg,[1] and Panas, after remarking that they developed on the normal as well as on the inflamed conjunctiva, says that many authors regard them as lymphectasias. Delacoeillerie[2] reports nine cases showing that the cyst cavities were circumscribed, and might anastomose with one another, that they are subconjunctival, and that their lamellar connective-tissue walls are lined with an endothelial layer.

Finally, the *fourth* sort of cysts is a special one of its own, developing in the conjunctival fornix of the upper lid, but it has never been much mentioned except by Rampoldi and Bull, as cited in Panas's recent hand-book on diseases of the eye.

Recent histological reports by De Vincentiis[3] and his scholars[4] show that this fourth species of cyst originates

[1] *Klin. Beobachtungen*, Berlin, 1874.
[2] *Thèse de Paris*, 1892.
[3] Italian Ophthalmological Congress, Naples, 1888.
[4] Moauro, *Clinica Oculista di Napoli*, 1887; Antonelli, *Annali di Ottalmologia*, 1890.

solely in an enlargement of Krause's glands, and Antonelli gives the following brief résumé of all that is so far known of this class:

"They are congenital, or more frequently acquired in childhood or adult age. The reason for the enlargement of Krause's glands is not always the same. The direct cause, however, is a blocking up of the secretion of these glands—at one time by alterations in structure, narrowing or even closing the lumen of the efferent ducts; at another time by neighboring tumors, which mechanically obstruct the passage of the contents of the gland, and finally modifications of the secretions themselves in sort or in amount. The clinical picture is that of a blister imbedded in the upper (rarely in the lower) fornix, whilst the skin of the eyelids is protruded along the entire length of the enlarged gland."

On everting the upper lid, the blister looks as if it were imbedded between the eyeball and the eyelid; it is more or less tense and transparent, with clear or brownish contents, and the overlying conjunctiva is slightly hyperæmic, particularly where the cyst has attained a certain size.

Having thus hastily reviewed the subject of conjunctival cysts as a whole, I now offer the history and anatomical examination of a recent case of my own.

C. A., æt. twelve, was first seen in the Milan Hospital, in November, 1893. He had been treated four years before for a perforating wound of the cornea and sclera, with prolapse of the iris and ciliary body. The incision ran between the insertion of the superior and internal recti. The injury terminated in phthisis of the eyeball. Up to November, 1892, he had no trouble with the eye, but about that date he observed the development of a small translucent body, like a blister, at the seat of the original injury, and which gradually enlarged. In April of the following year the tumor had increased greatly in size, almost encircling the cornea, and projecting between the eyelids very noticeably. There was, however, no pain in or about the eye or orbit, and the patient only consulted us on account of the excessive deformity produced by the enlargement, whatever its nature might be.

Ordinary observation shows a bulging forward, between the lids, of the entire fold of lower bulbar conjunctiva, just as if

there were well marked chemosis of the conjunctiva producing eversion of the lower lid. The summit of the elevation is pale pink in color, gelatinous in appearance, and with a mother-of-pearl-like reflex. The surface is covered with several tortuous blood-vessels, well set off against the anæmic background of the mucosa, the transparence of which causes one to think of hydrops of the conjunctiva. On separating the eyelids the prominence is seen to follow exactly the line corresponding to the fornix of the lower conjunctival sac. At the inner canthus the growth arises close to the caruncula lachrymalis, in correspondence with the plica semilunaris. The tumor, whatever its nature may be, lies obliquely to the surface of the sclera, and reaches its maximum thickness (about $2\frac{1}{2}$ *cm*) just below the lower margin of the cornea. Approaching this region the conjunctiva covering the tumor rapidly flattens out, so that the tumor appears to cease where the conjunctiva passes over into the superficial layers of the cornea.

The tumor as a whole is, as it were, divided into a lower horizontal portion, which corresponds to the lower margin of the cornea and above into two vertical horns, as one might call them, directed toward the inner and outer commissures. The cornea is cicatricially contracted and shapeless. On the sclera, between the insertions of the rectus superior and rectus internus and about 2 *mm* from the limbus, and directly over the inner horn of the tumor, we see a small, circular, grayish-black spot, as big as a hemp seed, and just below where the conjunctiva begins to elevate itself into this horn we see a black dot corresponding to the incarceration of the ciliary body. Lateral illumination shows nothing more of any consequence. Tension normal, and vision totally abolished.

In deciding upon the diagnosis of this case, our first idea was of hydrops. But even supposing that there was a collection of this nature beneath the conjunctiva, we had no right to think of an effusion such as we often meet with as a complication of inflammatory processes of the conjunctiva, that is to say, any ordinary chemosis, because there was no inflammatory reaction in the membranes of the eye over the eyelid.

On the contrary, there was much in favor of the idea of the presence of a serous effusion, such as only occurs with primary affections. The excellent health of the patient, the limitation of the affection to a circumscribed portion of the conjunctiva, and the history, inclined us to believe in the presence of a spontaneous

œdema, as often seen in convalescence from exhausting diseases (heart and kidney affections).

And then, after all, the last opinion was that we had to do with a neoplasm of the conjunctiva, and that neoplasm a cyst.

It is well known that some authors refer cysts of the bulbar conjunctiva near the corneal margin to injuries, and such an origin seemed possible here. Nevertheless we recalled how Saemisch says,[1] "that in marginal corneal fistulæ we often see a circumscribed roundish elevation of the mucosa at the corneal margin and having certain resemblance to a cyst of the conjunctiva, but differing from this in that it extends beyond the corneal margin. Moreover, wounds or incisions close to the corneal margin, and imperfectly healing with incarceration of the iris or development of a yielding cicatrix, may give rise, in the development of a cystoid scar, to alterations which bear great resemblance to a conjunctival cyst, but which, owing to their locality and to other possible alterations in the eyeball, should never deceive anyone as to their correct interpretation."

So, too, Wecker[2] remarks that there seems to be much confusion between fistulæ of the cornea, cystoid scar, and actual cysts of the conjunctiva.

These suggestions led us to think also of the possibility of an extensive cicatrix in the cornea and sclera with incarceration of the ciliary body, and that this was the starting-point of a filtration process of the intraocular fluids into the meshwork of the connective tissues which had thus collected beneath the conjunctiva without being at all a genuine cyst.

Finally, in this stage of doubt we decided that the only accurate way to establish our diagnosis was to remove a portion of the growth and examine it microscopically. But first with a syringe the contents of the tumor were removed, whereupon the entire mass collapsed. A Graefe's knife was then employed and a large piece of the anterior wall removed. Three small bits were then taken from various portions of this anterior wall, embracing the entire thickness of the conjunctiva.

After this excision, and eversion of the remaining conjunctival portions of the cyst wall, the sclera lay bare before us. We could then see that if this tumor were a cyst, it was neither adherent to the sclerotic nor to the episcleral tissue, upon which, by the way,

[1] *Graefe-Saemisch*, Band iv., Heft 1, p. 150.
[2] *Traité complet*, t. i., p. 424.

nothing was to be seen that could incline us to believe that there had been any serous accumulation of intraocular fluids. And thus we could prove that the opened cavity of the prominence had no connection with the previously described incarceration of the ciliary body in the incision of the former injury of the globe.

The incision that we had made in the conjunctiva was now sutured, but we soon saw that we had forgotten to examine whether or not the bulging conjunctiva consisted of one or of two layers, one corresponding with the upper surface of the mucosa, the deep one with the sclera, which could thus have formed the walls of a cystic cavity in the subconjunctival tissue whence the liquid above mentioned had been drawn. But, in point of fact, the histological examination made at a later date confirmed this supposition.

Microscopic examination of the liquid showed leucocytes, some swollen and hydropsic, some almost destroyed, others pigmented with black granular pigment within the protoplasm, endothelial cells like those in the vascular walls and in the lymph spaces, some flattened and lamellar; a few epithelial cells, some round, others right-angled with distinctly visible nucleus and finely granular protoplasm, and, finally, protoplasmic products of destruction of the white blood corpuscles.

The histological examination showed that the portion excised was formed from the conjunctival mucosa, with all the characteristics of that portion which covers the eye near the limbus of the cornea (Fig. 1, *a*, *a*, *a*, with many layers of the epithelium). The multiple layers contained numerous cells with alterations resembling those of mucous degeneration, and distinguished from other similar cells by their behavior toward the various staining materials employed; those with alum-carmine showing an intense color, those tinted with picro-carmine appearing on the whole almost colorless. The aspect of the whole reminds us of that of the goblet cells of the intestinal mucous membrane, for, like those, they have a round or oval swollen body filled with mucus, and a narrow basal portion in which we can distinguish the nucleus deeply stained, of an irregular form, and, as it were, pressed flat by thinned-out cellular contents. The underlying connective tissue (Fig, 1, *b*, *b*) shows nothing abnormal except slight hypertrophy and the associated engorged vessels. The meshes of the connective tissue contain the infiltration of lymphoid elements

peculiar to the conjunctival mucosa, but no lymph follicles. Only in the deeper layers does the submucous connective tissue show a specific arrangement. It is thicker, the infiltration less, its fibres regular, mostly united in longitudinal bundles and lying over one another in regular strata, as in all those connective-tissue structures which form the stroma of the cystic epithelium (Fig. 1, *d, d*). But what more characteristically formed the connection between the histological examination and the clinical diagnosis was the circumstance that directly to this tissue is attached a pavement epithelium with but few layers and interspersed with a few flattened elements (Fig. 1, *e, e*, and Fig. 2).

This histological condition confirmed the anatomical diagnosis of our case. There was no doubt that this growth represented a serous cyst of the conjunctiva from which we had unfortunately not excised portions of both walls, but merely a portion of the superficial wall and one corresponding to the conjunctiva in which evidently the cyst had developed, whilst the other and deeper wall corresponding to the sclera was lost during the excision or disappeared after the excision had been made. I should be inclined to think that, on the whole, there was no possible connection between the cyst and the injury several years before. In Uhthoff's case the cyst followed an injury, but directly afterwards, whilst in my case three years had elapsed after the injury before there were any signs of development of the cyst. Furthermore, our cyst did not show any of the signs which Uhthoff regards as characteristic of cysts of traumatic origin. In point of fact there were neither adhesions with the sclera nor eyelashes nor foreign bodies to be found in the walls or in the contents. Although the patient thought that the cyst first started from the locality of the original injury, we must not forget how little credit is ever to be given to what patients say, and more than this the examination proved that the tumor followed exactly the lower fornix of the conjunctival sac.

After all these considerations we must refer the origin of the cyst to the lower half of the eyeball, and in the last line *to cystic degeneration of Krause's glands.* Although it is true that the amount of material was so small in quantity that it

could hardly exhibit all of the characteristics of such an origin with absolute certainty (small daughter-cysts, emissary glands, enlargement of the cavity in connection with the mother-cyst), yet the histological marks of the cyst wall, and particularly those which appertain to its enveloping epithelium, were sufficient to establish the identity with Krause's glands. For cysts which owe their origin to an enlargement of such a gland exhibit the same epithelium, the numerous layers of which in our sections additionally prove that our cyst originated from the enlargement of an emissary tubule and not from a glandular acinus, for in the latter case the epithelium would have had but one layer.

Antonelli urges that cysts of the conjunctiva originating from Krause's glands can only be observed in the upper conjunctival fornix, because at that region they are very frequent (from 8 to 20), and often in a space of 20 *mm* lie crowded together, whilst the lower fornix contains hardly more than from 2 to 8, and those quite widely separated. He also cites as support for this argument the fact that he finds but one case of cystic enlargement of Krause's glands in the lower fornix on record, and that one was not anatomically demonstrated. In reply to this, I can only say that our cyst was anatomically demonstrated as a cyst originating from a Krause's gland in the lower fornix, and that it is hard to understand why such pathological processes should not develop or why a cyst should not originate from similar glands in that region, even if they are but few in number and widely scattered.

For all these reasons I feel justified in drawing the following conclusions:

(1) The origin of this cyst is to be referred to an enlargement of an emissary duct of one of Krause's glands of the lower fornix of the conjunctiva, in agreement with the pathogeny established by De Vincentiis. The impulse thereto may have been given by the original injury.

(2) The differential diagnosis between a genuine serous conjunctival cyst and a serous accumulation in the meshwork of the conjunctival tissues, preceded by filtration through a cystoid cicatrix, is not always easy to establish

clinically, but, on the contrary, often demands an accurate anatomical proof.

Explanation of the Figures.

FIG. 1.—(Zeiss, AA oc. 2) *a*, *a*, *a*, Conjunctival surface with enveloping epithelium.

b, *b*, *b*, Underlying hypertrophic conjunctival connective tissue.

c, Enlarged blood-vessel.

d, *d*, *d*, Underlying conjunctival connective tissue with specific arrangement, which forms the supporting stroma of the cyst epithelium.

e, *e*, *e*, Enveloping epithelium of the cyst wall.

FIG. 2.—(Zeiss, D.D. oc. 2) *b*, *b*, epithelium of the cyst wall much enlarged.

EXPERIMENTAL STUDIES ON THE EXTENSION OF FLUIDS INJECTED BENEATH THE CONJUNCTIVA.

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(*With Plate II. of Vol. XXXI., German Edition.*)

THE favorable action of subconjunctivally injected fluids, such as weak sublimate or salt solutions, on the resorption of pathological products in the eye, excited in us the idea that such injections produced increased lymphatic circulation in the eye [1] in the sense of the lymph-exciting remedy of Heidenhain.[2] And the first question naturally to arise was the extension of fluids injected beneath the conjunctiva. For many authors, and amongst others Motais,[3] have asserted that fluids thus injected remain *limited to the anterior portion* of the eyeball, and that for this reason he preferred to inject all remedies into Tenon's capsule.

In order to answer these questions fully, we made use of white rabbits exclusively, and employed as injecting material emulsions of India ink. Previous to the experiments, the eyes were all carefully examined, externally, as well as with the ophthalmoscope, and only rabbits with absolutely normal eyes employed.

[1] Mellinger: "Clinical and Experimental Investigations on Subconjunctival Injections and their Therapeutical Importance." These ARCHIVES, vol. xxix, Germ. ed. Marti: "Ueber Subconjunctivale Kochsalzinjectionen." *Inaug. Dissert.*, Basle, 1894.

[2] "Versuche und Fragen zur Lehre von der Lymphbildung." *Pflueger's Archiv*, Band xlix., 1, 1891.

[3] *Société française d'Ophtalmologie*, 1891.

The emulsion was made with distilled water, sterilized, moreover, by boiling, and the subconjunctival injections made with a sterilized Pravaz syringe. The canula was invariably inserted parallel with the corneal margin, and never in a meridional direction. The injection was always made very slowly, never with more than half a syringeful, and additionally, the syringe and needle, as the last step before the injection, were dipped in absolute alcohol.

After subconjunctival injection of the India-ink emulsion, the eye remains perfectly free from irritation, provided that the emulsion had been sterilized before using. Four or five hours later the ink can be plainly seen not only at the place of injection, but extending everywhere beneath the bulbar conjunctiva. On the following day, the entire region around and about the eye, especially all over the upper lid and toward the bridge of the nose, is tinted an intense black. Even more astonishing is the appearance of the iris, for that which in healthy albino rabbits appears of a pinkish red, is now of a dirty gray, and gives one the impression of a pigmented iris. We can even perceive in the folds of the iris, running parallel to the pupillary margin, still darker stripes of pigmentation than the radiating stripes. An examination with Westien's magnifying lens shows a discoloration still more intense than that perceived by the naked eye, but actual clumps of pigment are not definable. We may here remark, that this discoloration cannot be regarded as any sort of a reflex from the very black conjunctiva.

The ophthalmoscopic examination finds the media of the eye perfectly clear and transparent, but both below and above the optic papilla we see peculiarly dark curved marks as shown in Figure 1. These marks invariably appear in this shape in every rabbit's eye, but we have never been able to distinguish them at the *sides of the optic papilla.* The lower, and the rather darker figure of the two, lies close to the papilla, and seems to follow its margin like a black elevated ridge. A vessel coursing toward it is enormously dilated with blood, and is much more prominent than the associated vessel in the uninjected eye. It then turns as it approaches the black mark, follows for a short distance the

black inky wall, and finally disappears. Above the ridge we can see some fine choroidal vessels.

Above, and at some little distance from the papillary margin, we see a large semilunar figure, with its concavity directed toward the upper margin of the papilla. This too is also very intensely tinted, and over it course the much injected choroidal vessels. Farther in the periphery we see here and there in the fundus, but without any special arrangement and shining through the choroidal vessels, small dark spots as big as the head of a pin, as shown in Fig. 1, a little above the semilunar upper mark.

Numerous experiments with subconjunctival injections always verified the alterations as just described, and a number of similarly treated rabbits still remain under observation. As an example of our experiments I will here cite our notes on the examination and microscopy of a rabbit's eye.

A white adult rabbit with normal eyes in all respects. The right eye is carefully cocainized, and half of a thoroughly sterilized syringeful of moderately thick emulsion of India ink is injected beneath the conjunctiva, just above the cornea, with a carefully sterilized instrument. The immediate result is a thick black chemotic wall in the upper portion of the bulbar conjunctiva. On the following day the upper lid is swollen, and through the white hairs we can distinctly see the blackened skin of the eyelids. The localized chemosis of the conjunctiva has disappeared, but now the whole conjunctiva around the corneal margin is jet black, and the fold reflected back on the lower lid is also grayish. The iris, reddish-pink before the injection, is now of a streaked bluish-black, and shows fine black lines running parallel with the pupillary margin. The media are clear, and the ophthalmoscopic image resembles that shown in Fig. 1 as before described. On the following day some fine dark spots are seen in the periphery of the retina.

Within the next four weeks several injections were made, but no new appearances became visible in the fundus of the eye, though the new ones were more and more distinctly defined. Finally, the rabbit was killed, and the eye put into Mueller's fluid. After hardening, it was subjected to the usual treatment, and vertical sections made. Afterwards both halves were imbedded in celloidin.

If we examine sagittal sections of such a half of the eyeball with weak enlargement, we see that the ink has extended as shown in Fig. 2. Thick black threads of ink have passed from the limbus of the cornea both into the lids and into the posterior portion of the eye, and well along the optic nerve. The ink has passed along the muscle-sheaths and sclera into Tenon's capsule. When the optic nerve is reached the emulsion collects around it and spreads partly backward along the scleral sheath and partly into the connective tissue surrounding the nerve, both above and below.

Even this superficial examination with low powers shows how extensive a circuit, passing completely around the eyeball, India-ink emulsion makes when injected beneath the conjunctiva. Having thus shown what ordinary observation reveals, we will next describe the results of more careful examination, followed out section by section, and these we hope will partly explain the symptoms seen in the living injected rabbit's eye, and partly will give us further information concerning the action and therapeutics of similar subconjunctival injections in diseased eyes.

Conjunctiva.—Carefully following the path taken by the injection, we find various accumulations of the same at the limbus of the cornea, in the wide-meshed connective tissue beneath the epithelium, and farther, we see little cones of India ink penetrating into the sclera possibly for about one third of its entire thickness. At the limbus the nodules of ink are very closely aggregated, and near the spot of injection a smaller portion passes to the cornea and pushes forward a moderate distance directly beneath the corneal epithelium.

Cornea.—Examination with low powers of sagittal sections shows the lymph spaces resembling fine black threads. But with higher powers, or with the immersion lens, these threads are seen to be composed of fine granules of ink in substance. Meridional sections of the cornea reveal more easily these inky granules in the interior of the lymph spaces. Here we observe that the granules lie along the walls of the spaces, whilst the centres are open. The epithelium of the cornea shows a few leucocytes laden with ink granules, whilst a few of the same are also seen beneath the endothelium.

The *sclera* shows in the lymph spaces ink granules which increase in number in the spaces nearest the optic nerve. The greatest accumulation lies upon the sclera and can be followed

along the ciliary nerves as far as their passage into the suprachoroidal space.

Muscles.—All of the muscles are not only infiltrated with ink in their connective-tissue sheaths, but it follows the connective tissue surrounding the muscular bundles, and assumes in this locality a globular formation. The tendons also are surrounded with ink granules.

The optic nerve shows a very large deposit of ink in the intercellular substance, and in the fatty tissue. The numerous heaps of ink here take the same globular form as first seen in the connective-tissue surrounding the muscular bundles. The microscopic image suggests a meshwork filled with black drops, some of which show a sharply defined contour.

Just *above* the entrance of the *optic nerve*, and therefore in correspondence with that portion of the globe into which the injection was made, the amount of ink is much greater than at any other spot. Here we see two black streams pass into Tenon's capsule, and on the sclera toward the optic nerve. The greater portion of the ink is found beneath the dural sheath, less in the arachnoidal space, and a small amount enters the nerve itself.

Beneath the optic nerve the quantity of ink is much less, but it still shows a distinctly black streak between Tenon's capsule and the sclera. At the place where the optic nerve bends the ink is spread out into a very delicate globular form and passes on to the sclerotic ring, decreasing in amount so as hardly to be discerned except with high magnifying powers.

The uveal tract including the ciliary body and the choroid contains only a few granules, but they require high magnifying power and a long investigation to perceive. They can be seen rather more easily in the choroid, not in the tissue, but mostly along the lines of connective tissue.

No trace of the ink granules can be discovered in the retina.

The microscopic examination gives remarkable results concerning the extension of subconjunctivally injected fluids, and at the same time explains some phenomena observed in the living eye after the injection of ink. First we see that the ink thus injected extends around the entire globe, and this thus explains the powerful action of different fluids injected beneath the conjunctiva. Our examination confirms the observation already made on the living, that aseptic ink

solutions injected beneath the conjunctiva do not produce any inflammation. The fluid passes along the connective-tissue spaces by the muscles and into Tenon's space; in other words, along paths which the lymph current generally takes. At some spots we see connections with the inner lymph spaces of the eye; thus we see ink along the penetrating places of the ciliary nerves, as far as the suprachoroidal space, and in the dural sheath of the optic nerve. *But we must at the same time insist that the amount of ink actually entering the eyeball is small in comparison with the total injected.*

The curious discoloration of the iris after the injections cannot be explained by the presence of ink, because so little of the same is actually discovered in the tissues. Nor can we refer it to any conjunctival reflex. And we are finally driven to believe that the actual cause of this curious phenomenon is the darkening of the fundus produced by the black marks about the optic papilla. The proof for this is shown by injections of ink *into the vitreous*, whereupon the iris at once becomes exceedingly dark.

The circumpapillary figures are due to large amounts of ink collecting in that region, and shining through the sclera. Their absence from the sides of the papilla is due to the presence in rabbits of double-contoured nerve fibres laterally from the papilla. The small dark spots above the papilla correspond to the entrance of ciliary nerves surrounded with granules of ink.

If we investigate the literature of observations on subconjunctival injections, we find but little of value. Deutschmann, in his studies on the extension of sympathetic ophthalmia, made injections into Tenon's capsule, and found that they penetrated as far as the intravaginal space of the optic nerve. And Darier, at the Heidelberg Congress in 1893, in referring to these experiments, asserted that he had ophthalmoscopically discovered granules of ink in the fundus of the eye. In the discussion, Sattler remarked that he had observed the ink injection in the form of a ring around the papilla, and attributed the transportation of the granules to the posterior pole of the eye to leucocytes. But this our

experiments do not confirm. For we fail to find any inflammation in eyes so treated, and consequently we find extremely few leucocytes. The main accumulation of ink lies, as Fig. 2 shows us, in thick black masses along the muscles and in Tenon's space, and then farther back around the optic nerve. All along this path the mass of ink consists of large black, thickly compressed granules, whilst leucocytes laden with fine granules are very rare indeed. Although this condition argues against Sattler's views, we believe that the following experiment with injections of Berlin blue in dead animals shows that we must not call on leucocytes in order to explain the circumbulbar extension of subconjunctivally injected India ink.

Sheep and rabbits were employed directly after death, with perfect sterilization. The Berlin blue was placed in a trough about 1 *cm* above the head, and a rubber tube so arranged as to let pass into the canula of a Pravaz syringe a drop of the solution at a time, so that there could be no question of force urging the fluid onward into any but a natural route. The canula was then placed beneath the conjunctiva, just as in the other experiments, and the solution permitted to make its way slowly into the subconjunctival tissues. Immediately there appears around the conjunctiva a dark-blue chemotic ring, which embraces the whole globe; in about half an hour the eye begins to project slowly from between the lids, and with the ophthalmoscope we see the same figures about the papilla as after the injections of ink. After enucleation, all of the eyes, no matter whether exposed from two to six hours to the fluid blue, exhibited an intense blue color which extended around the whole eye to the optic nerve.

The microscope shows the conjunctiva lifted off from the eyeball by the fluid, and thoroughly permeated with it. A small portion of the blue has passed toward the margin of the cornea, but the largest portion has extended backward beneath the conjunctiva, surrounding the muscles entering into Tenon's capsule, and passing between the latter and the sclera toward the optic nerve. Reaching here, it passes between the connective and the fatty tissue which surrounds

the globe, and applies itself in a thick layer to the dural sheath. The side where the injection is not made shows the blue following the sclera in a thick stripe. No section shows that the interior of the eye has been reached.

These experiments verify the results made on the living eye, for the action of leucocytes in dead eyes is positively excluded. Therefore we can conclude with certainty that *subconjunctivally injected fluids, following the greater lymph spaces, surround the entire globe.*

So far as communication with the interior of the eye is concerned, our experiments confirm the views expressed by Deutschmann and other observers. *We are therefore inclined to believe that fluids injected beneath the conjunctiva not only surround the eye and the optic nerve, but additionally by paths of communication can communicate with the suprachoroidal and intervaginal spaces of the optic nerve.*

ABSTRACTS OF THE PAPERS IN VOLUME XXX. (1895) OF THE GERMAN EDITION OF THESE ARCHIVES NOT PREVIOUSLY TRANSLATED.

By Dr. WARD A. HOLDEN.

I.—A Contribution to the Etiology of the Congenital Malformations of the Eye.

By Drs. L. WEISS and W. OTTINGER.

Adolf B., æt. four, had, in the left eye, a coloboma of the iris downward and somewhat inward. The margins of the cleft converged toward the periphery and united before reaching the ciliary body, and the defect in the deeper layers of the iris was not so extensive as that in the superficial layers. There was no coloboma of the choroid. The disc was oval with a large dark conus to the nasal side, half as broad as the disc itself. The eye was highly hyperopic. The right eye was normal.

The interesting feature of the case is that the mother had a coloboma downward in her left eye, due to an iridectomy done for an injury in childhood. Of the four children, the oldest squints and has poor sight, the next two are healthy, and the fourth has the coloboma of the iris just described. At first glance one would be inclined to think this a case of inheritance of an ocular defect due to injury. If, however, such a general disposition existed, we should expect to find more cases of congenital malformation in the eyes of children whose parents' eyes have been injured or mutilated; yet such cases are very rare. As is well known, many observers like Weismann deny, not only the possibility of the transmission by inheritance of mutilations, but

even the transmission of acquired characteristics. In opposition to this view, however, a series of observations has been published recently which indicate that mutilations may be transmitted.

Samelsohn made the following observation: A male rabbit had, in the right eye, an inoculation tuberculosis; in the left, experimental anophthalmus; the female had bilateral experimental ocular tuberculosis. Of three young, one had healthy eyes; two had, left, microphthalmus; right, nodules in the iris.

Deutschmann records the following: First generation of rabbits, the male had a scar in the iris following nodular formations brought about by the inoculation of tissue supposed to be tuberculous. In the fundus there were peculiar pigmentary changes. The albino female had traumatic cataract. Of six young, four had pigmentary changes in the fundus, one had phthisis bulbi with choroiditis disseminata and atrophy of both optic nerves. Second generation: the same male, the female having infiltration of the vitreous and retinal changes following an injection into the vitreous. Of the young, one was normal, one had, right, a dark brown iris; left, a light blue iris; right, pigment changes in the fundus; and one had a bilateral coloboma of the iris and choroid.

Perlia reports the following case: The mother in the early months of pregnancy had a severe inflammation of both eyes, leaving spots on the corneæ. The infant had, left, anophthalmus; right, coloboma of iris and choroid. The other children were healthy. The time of the mother's ocular affection corresponded to the period of development of the fœtal ocular cleft.

Richter speaks of a man who had lost his left eye from suppuration fifteen years before his marriage, and both of whose sons had microphthalmus on the left side.

Notwithstanding all these reports of hereditary transmission of defects, our case cannot be considered as belonging in this category. Two cases which will now be recorded are of a different sort, they being malformations in children whose parents suffered from ocular affections in pregnancy.

Mrs. B., æt. thirty-seven, has had six children, two of whom have congenital malformations of the eyes. The fifth was born totally blind, the left eye being absent, and the right having a coloboma of the iris. For eight months of this pregnancy the mother suffered from hemeralopia. The sixth child was examined at the age of seven, and was found to have an inferior coloboma of the iris and choroid in the left eye, this eye being smaller than the right. With corrected refraction V $= \frac{6}{12}$ in each eye. The disc in the left eye was vertically oval, and the pigment ring was open below, suggesting a coloboma. There was also a nasal conus. The coloboma of the choroid did not reach posteriorly to the disc. The mother was at that time suffering from hemeralopia and had a slight concentric contraction of the field with normal acuteness of vision and normal color perception. The fundus was dotted with little light spots apparently lying in the outer layers of the retina. No albuminuria.

Another interesting case is the following:

Rosa S., aged twenty weeks, was brought to be examined. In the right eye there was a coloboma of the iris in the usual downward and inward location, and also a coloboma of the choroid and of the optic nerve. On the left side there was anophthalmus and lower-lid cyst. The mother, during pregnancy, suffered from hemeralopia. At the time of examination her eyes were organically and functionally normal, and no cause for the hemeralopia could be discovered. In both these cases, however, the cause which produced hemeralopia in the mother in the course of her pregnancy seems also to have produced ocular malformations in the child, the left eye being affected when the malformation was monocular, and the left eye being more severely affected when the malformation was binocular, in accordance with the general experience that most congenital ocular malformations are found on the left side.

II.—On Silver-Impregnation of the Corneal Tissue.

By Dr. RUDOLF GRUBER,
Assistant to the First Eye Clinic at Vienna.

In order to obtain positive pictures of the corneal corpuscles in frogs, rabbits, and cats, I have employed the following method. The living cornea is bathed with a ten per cent. solution of hydrochloric acid until it becomes opaque.

The cornea then, without being washed, is rubbed over gently with a stick of nitrate of silver. It is then cut out and exposed to sunlight for one or two days, and a fine positive staining of the corneal corpuscles appears. The color of the ground substance is light brown, and that of the corpuscles dark brown. The branchings of the cell processes are more numerous than in negative pictures.

As is well known, His and Von Recklinghausen have obtained positive silver pictures by other methods. His laid the whole cornea or the sections, after treating them with silver, into salt solution or aqueous humor. Von Recklinghausen treated the cornea, after the silvering process, with very weak salt solution or dilute acids. I have obtained positive pictures in these ways, but never such fine ones as by my own method, which brings out the sharp contours of the cells and their delicate processes.

III.—On Injuries of the Eye. Part I: Statistical.

By Dr. HILLEMANNS,
Assistant to the University Eye Clinic at Bonn.

In the Bonn clinic, between April 1, 1893, and April 1, 1894, 175 patients received hospital treatment for injuries of the eye. These were due to various agents, but principally to splinters of stone, iron, and wood, and to stalks of grain in the harvest field.

Among the women there were 10 cases of perforating injury, without peculiarities.

Among the men there were 44 cases of perforating injury: 26 of the cornea, 15 of both cornea and sclera, and 3 of the sclera alone. In about 33 per cent. of the cases the foreign body remained in the eye. The results as regards preservation of sight were bad, only 38 per cent. of the eyes preserving useful vision. Purulent infection developed in 11 of the 44 cases, and in 14 cases enucleation was required; sympathetic ophthalmia coming on but once, in a patient who refused enucleation when it was advised.

As to treatment, we never used scleral sutures, but bandaged the eyes, and kept the patient in bed. In severe inflammatory conditions hot applications were used. The

external skin was cleansed, and the sac was washed out frequently with sterilized water, or with boric-acid solution when there was much discharge.

Serpent ulcer was seen 19 times in women, 8 times being complicated with blennorrhœa of the sac. When atropine and hot applications had no effect, operative procedures were employed, viz., cauterization once and keratotomy ten times. The latter operation was followed by most favorable results, and the average duration of clinical treatment was three to four weeks. Many of the younger women with serpent ulcer had no blennorrhœa of the sac, and these cases were milder and did not require operation.

Serpent ulcer was seen in men 38 times, 13 times being complicated with suppuration in the tear sac. Keratotomy was done in 15 cases, and cauterization in 2. In 7 of these cases vision from $\frac{1}{600}$ to $\frac{20}{70}$ was obtained. The average duration of treatment was somewhat longer than with the women.

The paper further contains detailed statistics as to the nature and results of the injuries, and as to the agents causing them; with a plea for the more frequent employment of the regular Saemisch operation in serpent ulcer.

IV.—The Functional Diseases of the Ora Serrata and the Ciliary Portion of the Retina.

By Dr. W. SCHOEN, Leipsic.

It is difficult to say what are to be regarded as the normal anatomical relations of the ora serrata and the pars ciliaris retinæ, because pathological changes are so frequent that they have often been described in text-books as normal conditions. These functional changes of the anterior margin of the retina proper and of the epithelial cells composing the pars ciliaris retinæ are to be found in almost every eye whose accommodation is strained, since from these parts spring the zonula fibres.

Pars Ciliaris Retinæ.—In the normal eye the pars ciliaris retinæ is composed of regularly arranged cylindrical epithelial cells. The *mechanical* changes which this layer under-

goes from traction are as follows: the cells are drawn out to a point, and they lose their regular arrangement. *Inflammatory* changes lead to signs of degeneration and proliferation. The underlying pigment epithelial cells also degenerate and give up their pigment, and with the destruction of the cells the zonula fibres also break down.

We may distinguish an acute, a masked, and a chronic functional inflammation of the pars ciliaris retinæ. The clinical picture is that commonly called simple cyclitis or iritis serosa in its different intensities. A great number of clinical histories of such cases are given in tabular form, in almost all of which the author found hyperopia or astigmatism sufficient to give rise to accommodative strain. Under the usual methods of treatment these cases last for weeks or months and are very prone to relapse. The author prescribes the proper glasses and uses a few drops of cocaine and atropine and the patients soon recover.

The Ora Serrata.—The author describes in detail the anatomical structure of the ora serrata. In its normal state, the retina ends in about 840 small tooth-shaped projections. This portion of the retina, like the pars ciliaris, is subject to mechanical changes from traction of the zonula fibres, and also to inflammatory changes. The mechanical changes consist in the development of larger spur-shaped projections. The inflammatory changes consist in proliferation and degeneration in and about these spurs, with accompanying changes in the choroid and pigment epithelium leading to the formation of visible patches.

This chorio-retinitis of the ora serrata always comes on with the other symptoms in eyes with strained accommodation, and appears in an acute or a chronic form, the former accompanied often with opacities of the vitreous, and scleritis.

The causes are hyperopia and astigmatism according to the rule. The results are: astigmatism against the rule, equatorial cataract, accommodative excavation, latent convergent strabismus, and chorio-retinitis oræ serratæ.

When the ora serrata is displaced forward, the zonula fibres slacken, the lens pushes the iris forward, and the

width of the chamber angle is lessened. These changes, according to their extent, fall into four categories.

I. Normal position of iris and lens.

II. Ordinary accommodation, the outer half of the iris concave, the inner half convex, the anterior chamber shallower in the centre.

III. Pushing forward of the entire iris, more or less noticeable prolapse of the lens, convexity of the entire surface of the iris, shallowing of the entire anterior chamber.

IV. Apposition of the iris to the cornea, obliteration of the anterior chamber, absolute glaucoma.

The pressing forward of the lens leads to an increase in refraction, and the tilted position which it may assume leads to acquired astigmatism, usually against the rule. The author's cases of glaucoma have almost exclusively been in eyes with uncorrected hyperopia or astigmatism, and he believes that the correction of the refractive error would in many cases have prevented the development of glaucoma.

V.—The Operative Treatment of Trachomatous Xerophthalmus.

By Dr. N. ANDOGSKY, St. Petersburg.

In Russia 30 per cent. of the total blindness is due to trachoma, while in some districts the percentage is as high as 80. The pathological changes leading to loss of sight are mostly due to mechanical irritation, but another important disastrous change is xerophthalmus or dryness of the cornea and conjunctiva. This affection comes on in the cicatricial stage of trachoma when the mucous glands of the conjunctiva become atrophied. The entire extent of the conjunctiva may be involved. The lack of moisture causes the corneal epithelium to become cloudy under the drying action of the air. The xerophthalmus may reach such a grade that the surface of the cornea and conjunctiva has more the appearance of dirty cutis than of mucous membrane. In xerophthalmus another source of moisture may be wanting, viz., the tears, because the canals of the lachrymal glands may be obliterated, and even the glands destroyed.

At the present time, when the principles of transplantation of skin and mucous membrane, according to Reverdin, Wolfe, and Thiersch, are so well understood by ophthalmologists, the hope is awakened that xerophthalmus may be relieved by operative interference. I wish to speak here of a different sort of operative procedure which was suggested by Dr. Rudin, but which has been little practised, and is not described in print. This consists in shortening the palpebral fissure by sewing together the lids. Dr. Rudin performed this operation on the theory that in many cases of parenchymatous xerosis the atrophy does not involve all the mucous glands of the conjunctiva and all the ducts of the lachrymal gland, although there is not sufficient secretion to keep moist the entire surface of the cornea and conjunctiva that is exposed to the air; but that if the exposed surface was much reduced in extent it might be kept sufficiently moist to remain healthy. And on uniting the lids so that only a small portion of the cornea was exposed, it was found that the dried cells became macerated and were thrown off, the conjunctiva became more nearly normal, and the cloudy cornea cleared up.

I myself have done the operation five times. It begins with the Flarer operation, the margin of the lid being split, and a parallel incision in the skin of the lid 2–3 *mm* from the margin being made, the lashes being removed in the flap thus taken out in the entire length of the lids. In the centre of each lid, corresponding to the position of the cornea, the skin and mucosa are united by two sutures. The outer and inner portions of the two lids are brought together, the freshened edges of the upper and lower lid being united with four sutures, leaving a small opening about the lachrymal puncta, and an opening 5–6 *mm* long before the pupil. In two of the five cases the results, as regards improvement in sight and lessening of the discomfort, were favorable; in two others some improvement was noticed in the short time the patient could be kept under observation; and in one there was improvement only in the matter of the dryness.

VI.—On Formaldehyd as a Preservative of Human Eyes for Operative Practice in the Phantom.

By Dr. N. Andogsky, St. Petersburg.

Eyes preserved in formol are well adapted for use in operative courses. They differ from the normal fresh eyes only in a greater hardness of the cornea that is felt in making the section, and in the fact that the punctured cornea does not collapse. In seizing the iris a toothed forceps is preferable on account of the hardening of the iris tissue, which smooth forceps do not readily grasp. The vitreous preserves nearly its normal consistence.

The following procedure can be recommended: Eyes with transparent corneas are placed in a 0.05–0.1 per cent. aqueous solution of formaldehyd, which is prepared by adding 5–10 drops of commercial 40 per cent. formalin to 200 *ccm* of water. After a half hour the liquid should be changed; the vessels containing it should be carefully covered, as it readily evaporates. Eyes may be left in this liquid as long as a week, but if it is desired to preserve them longer, they should be transferred to a thymol solution, 1:5000, in which they keep for several weeks.

(*To be continued.*)

REPORT OF THE THIRTY-THIRD ANNUAL MEETING OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY.

HELD IN WASHINGTON ON MAY 5 AND 6, 1897.

BY DR. ARNOLD H. KNAPP, NEW YORK.

A general meeting of the Congress was held under the direction of this Society on Tuesday, May 4th.

The subject—**The gouty and rheumatic diatheses and their relation to diseases of the eye**—was treated under the following titles:

1. **Lesions in the retinal vessels, retina, and optic nerve, associated with gout,** by Dr. C. S. BULL of New York. Hemorrhagic retinitis is usually described as the common complication of gout. Gouty retinitis is like syphilitic retinitis. It may be accompanied by hemorrhages and opacities in the vitreous. Œdema of the retina is often the first sign. The changes seen by the ophthalmoscope are: changes in the vascular walls, a circumscribed retinitis occupying the posterior zone of the fundus, a yellow exudate with or without hemorrhages in the vitreous, and an optic neuritis with or without a retinitis. The central vision is affected, though total blindness is rare as the periphery usually escapes. In conclusion the author stated that: (1) the changes are bilateral though rarely symmetrical; (2) the primary changes in the vascular walls are very minute; (3) the angio-sclerosis and patches in the retina cause impaired central vision, the periphery being less affected; (4) the central vision is progressively affected to a certain point; (5) hemorrhages in the retina occur usually in the early stages of the disease; (6) angio-sclerosis of the retinal vessels is the most marked feature; (7) also a yellowish granular exudation in the retina is important,

—it is located at the posterior pole of the eye and does not invade the macula until late in the disease; (8) the changes in the optic nerve are generally intraocular.

2. Dr. S. O. RICHEY, of Washington, D. C., read a paper on **The relation of gout to glaucoma,** and traced the association of increased intraocular pressure to arterio-sclerosis and cardiac hypertrophy. The author criticised the various glaucoma theories and advanced his own well-known views on the latter subject.

3. **Cataract and its association with the gouty and rheumatic diatheses,** by Dr. S. D. RISLEY, of Philadelphia. The author drew attention to the fact that the gouty and rheumatic diatheses were the most frequent causes of chronic and subacute inflammations of the uveal tract, characterized by vascular changes in the choroid and opacities of the vitreous. This could readily account for the cataractous change as the nutrition of the lens suffers.

4. **Gouty and rheumatic affections of the uveal tract,** by Dr. R. SATTLER, of Cincinnati. In the opinion of the author inflammation of the iris and choroid were more frequently caused in this country by the rheumatic diathesis than by gout. According to J. HUTCHINSON, the greater part of these affections were due to gout. Usually the early stages of gout show ocular complications. Diseases of the uveal tract due to gout show nothing distinctive in themselves. The results of operative interference in eyes with degenerative processes of gout are not favorable.

5. **Rheumatic and gouty affections involving the cornea, conjunctiva, and sclera,** by Dr. R. A. REEVES, of Toronto. Among the rheumatic and gouty affections of those parts of the eye, the author drew attention to (1) a form of keratitis of severe type, which usually receded in a few days; (2) a form where the cornea becomes opaque like porcelain; (3) the band-like opacities of the cornea; and (4) forms of episcleritis and scleritis.

The discussion was opened by Dr. J. M. DA COSTA, of Philadelphia, who stated that in general medicine four-fifths of the chronic lesions called rheumatic were not rheumatic at all. He thought that the same might hold true in ophthalmology. Our knowledge of acute rheumatism and acute gout is somewhat more definite. He does not believe that there is such a disease as

"rheumatic gout"; he prefers the term rheumatoid arthritis, and considers it an independent disease of neurotrophic origin. In general he has met with conjunctivitis, sometimes with iritis, in connection with acute rheumatism. In gout the eye complication has occurred during the acute attack or later, and usually one eye was involved after the other. Eye affections are very uncommon in rheumatoid arthritis. He has observed patients with lithæmic symptoms to show eye complications which usually began in the one and later involved the other eye, and were accompanied by headache.

In the regular session of the Society the first paper was on the

1. **Pathology of chronic pseudo-membranous conjunctivitis,** by Dr. L. HOWE, of Buffalo. The author reported on two cases of this affection with presentation of one of the cases. The bacteriological examination showed the presence of a diplo-streptococcus in both, associated with the Loeffler bacillus in one, which resulted in the loss of the eye, while the other recovered. The author favors the classification of membranous conjunctivitis of Sourdille and Parinaud, which is the following: 1. Catarrhal; 2. Staphylococcus; 3. Streptococcus; 4. True diphtheria; but would add to the third group a diplo-streptococcus subdivision.

2. **Enucleation of both eyes owing to panophthalmitis in a case of exophthalmic goitre,** by Dr. J. A. SPALDING, of Portland, Me. In a case of exophthalmic goitre, a process characterized by optic neuritis, then sloughing of the cornea and panophthalmitis attacked both eyes one after the other, and necessitated enucleation. The orbital tissue remained as a brawny, rigid, protruding mass for a long time. The author considers an inflammation of the orbital tissue to have been the beginning of the process.

3. **Exophthalmic goitre after ether,** by Dr. AIKEN, of Savannah. During ether anæsthesia symptoms of exophthalmic goitre appeared in a patient, and persisted for six to seven years.

4. **Report of cases of pulsating exophthalmos,** by Dr. W. H. WILDER, of Chicago. The author reported on two cases of pulsating exophthalmos after trauma, and one of spontaneous origin. The literature of the subject, prognosis, and treatment were then reviewed.

5. **Double exophthalmos with destruction of eyes in an infant from a sarcoma starting probably from the**

dura near the sella turcica, with specimen, by Dr. S. M. BURNETT, of Washington, D. C. The author described a case of double exophthalmos in an infant, with paralysis of the sixth nerve, a swelling in the temporal region, loss of vision, ulceration of corneæ, followed by destruction of both eyes, and a fistulous tract at root of nose. At autopsy a tumor measuring 2½ by 2 by 1½ inches was found near the sella turcica; the neighboring bone, especially the orbital plates, were unevenly thickened; the ethmoid bone was completely destroyed. The tumor contained the optic and oculomotor nerves, and was a sarcoma.

6. **Diphtheritic conjunctivitis,** by Dr. MYLES STANDISH, of Boston. The author spoke of the advantages of early bacteriological examination and the antitoxin treatment. A severe and rapid corneal infiltration, even when conjunctival affection is slight, is always suspicious of a diphtheritic process. The secretion of every case of purulent conjunctivitis should be examined bacteriologically.

Discussed by Drs. DE SCHWEINITZ and WEEKS.

7. **Report on a new operation for prothesis in cases of cicatricial orbit,** by Dr. G. C. HARLAN, of Philadelphia. A lead wire is passed through the cicatricial bands round the bottom of the cavity, with the view of forming a sulcus. The wire is left in place for a number of weeks, and is then dissected out. The sulcus remains. A lead shell is worn at first, and is replaced by the artificial eye, which is borne without discomfort.

8. **A case of ivory exostosis of the orbit,** by Dr. W. F. NORRIS, of Philadelphia. The tumor of six years' growth arose from the os planum of the ethmoid bone, and pushed forward the internal palpebral ligament. It was successfully removed.

9. **Supplementary report of a case of ivory exostosis of the orbit,** by Dr. R. SATTLER, of Cincinnati. In the case previously reported upon by Dr. Sattler, a discharging tract persisted, and necessitated a reopening of the frontal sinus. Another exostosis was found in the outer part of the sinus extending up and back. This was removed. The specimen was exhibited.

10. **A unique intra-ocular tumor,** by Dr. E. JACKSON, of Philadelphia. In a previously sound eye the usual symptoms of a tumor led to enucleation. The tumor showed the histological character of cartilaginous tissue with only slight tendency to ossification.

11. **Angio-sarcoma of apparent retinal origin,** by Dr. W. B. JOHNSON, of Paterson, N. J.

12. **Two cases of pieces of steel in the eye, removal after localization with the X-rays,** by Dr. W. THOMPSON, of Philadelphia. In the first case the foreign body was in the crystalline lens. The X-ray was here valuable to determine whether the foreign body was of metal or of wood. The lens with the foreign body was successfully extracted after iridectomy. In the second case the foreign body was encapsulated in a dense connective band in the fundus. Its exact localization was made possible by a radiagraph with aid of a simple and ingenious localization arrangement, which was demonstrated by the author, Dr. SWEET, of Philadelphia.

13. **Value of repeated and differently placed exposures to the Roentgen ray in determining the location of foreign bodies in and about the eyeball,** by Dr. C. A. OLIVER, of Philadelphia.

14. **Endothelioma of lower lid,** with specimen, by Dr. C. H. WILLIAMS, of Boston.

15. **Congenital ptosis and epicanthus,** by Dr. R. SATTLER, of Cincinnati. In his cases the accessory levators, the occipitofrontalis muscle, were sufficiently developed to make operative interference unnecessary. With the epicanthus, inversion of lid and epiphora were associated, which were remedied by the exsection of a triangular piece of skin at the root of the nose. For ptosis the author prefers the advancement of the levator palpebræ tendon and the Panas operation.

16. **A new ptosis operation,** by Dr. W. H. WILDER, of Chicago. After an incision along the orbital margin, the suspensory ligament is shortened by two buried gathering sutures.

17. **Law of refraction—change following increase or decrease in body-weight,** by Dr. G. M. GOULD, of Philadelphia. The author advances the supposition that the orbital fat changes proportionately with increase or decrease in body-weight and so, in case of increase of orbital fat, the eyeball is pressed upon, and the refraction becomes hypermetropic or less myopic, and conversely a diminution of fat results in an increase of axis and corresponding change in refraction.

18. **Bifocal glasses for cataract patients.** Dr. W. THOMPSON exhibited a pair of bifocal glasses, made by Borsch, where the refraction in the lower half of glasses was increased 2 D., by adding a segment of flint glass to the remaining crown glass. The resulting combination is also achromatic.

19. **Saccharine diabetes associated with changes in refraction,** by Dr. S. D. RISLEY, of Philadelphia. In a case of diabetes a decrease of the hypermetropia was noted with increase of amount of sugar in urine. No changes in the lens or vitreous could be observed, and the author inclines to the belief that there is a change in the density of the fluids which bathe the lens.

Discussed by Drs. FRIDENBERG and WADSWORTH.

20. **A series of consecutive cataract operations,** by Dr. R. L. RANDOLPH, of Baltimore. This is a careful report of a number of cataract extractions, some of which were performed under unfavorable surroundings. Among the complications may be mentioned two cases of maniacal excitement and one case where the anterior chamber remained open for seventeen days.

21. **Hemorrhages during or after cataract extraction,** by Dr. O. WADSWORTH, of Boston. The author reported six cases of intraocular hemorrhages in association with the cataract operation where no cause could be found, where the behavior of the patients was good, and no suspicion was present before the operation.

22. **Cholesterine crystals in the opaque lens of a child,** by Dr. L. A. W. ALLEMAN, of Brooklyn. In an infant of twenty months with congenital cataract, numerous immovable, glistening particles were found in the lens. Under the microscope the cholesterine crystals were visible.

A general discussion on cataract extraction followed. Methods of procedure and complications were freely discussed by Drs. HOWE, RISLEY, ST. JOHN, REEVES, WEBSTER, THEOBALD, GREEN, WEEKS, WILLIAMS, RAY, WADSWORTH, and others. Dr. WEBSTER reported a case in which during the cataract extraction a large quantity of vitreous prolapsed. Three days later, on bandaging the eye, the retina was found prolapsed in the wound; the eye was then enucleated. Dr. HOWE exhibited a self-retaining fixation forceps. To procure *anæsthesia of the iris* injection of cocaine in the anterior chamber was advocated, also a subconjunctival injection of cocaine above line of incision.

23. **Taxis in intraocular tension,** by Dr. S. O. RICHEY of Washington. The author described the anatomical relations of the venæ vorticosæ and their bearing on the intraocular pressure and venous stasis according to his views of glaucoma, previously mentioned.

24. **Retinitis proliferans,** by Dr. J. E. WEEKS, of New York. The author described a number of cases of retinitis proliferans,

two of which were illustrated with macroscopic specimens, and gave a review of the literature on the subject.

25. **A case of retinitis circinata,** by Dr. E. FRIDENBERG, of New York. Attention was drawn to the fact that the blood-vessels were not obscured by the patches, and to the presence of new-formed venous vessels, which was well shown in a drawing. The author emphasized the importance of distinguishing the relatively harmless character of this retinitis from the albuminuric form.

26. **Tobacco-amblyopia, with autopsy and microscopic examination of specimens,** by Dr. G. E. DE SCHWEINITZ, of Philadelphia. The author traced the atrophy of the papillo-macular bundle through the optic nerve, chiasm, and tract. The ganglion cells in the region of the macula showed no change whatever, so that this case does not support Nuel's views.

27. **Marked impairment of central vision following prolonged use of the affected eye,** by Dr. S. THEOBALD, of Baltimore. Eighteen days after calibrating a burette in the chemical laboratory, the patient became affected with a central exudative retinitis. Vision was reduced to $\frac{8}{200}$. The patient subsequently completely recovered.

28. **Hysterical or functional blindness,** by Dr. A. A. HUBBELL, of Buffalo.

29. **A group of four cases of optic atrophy due to sexual excess,** by Dr. J. A. SPALDING, of Portland, Me. Four young men became affected with optic-nerve atrophy. No cause could be found but sexual excess. There were no signs of tabes.

30. **A study of some of the ophthalmic changes in chlorosis, leucæmia, and leucocythæmia,** by Dr. C. A. OLIVER, of Philadelphia. The author described some of the changes of the fundus, as seen with the ophthalmoscope in some of the diseases of the blood. The descriptions were illustrated by some beautiful ophthalmoscopic drawings.

31. Dr. J. O. GREEN, of St. Louis, reported on a case of **embolism of the central retinal artery,** where a small central patch of the retina remained preserved. The vision was $\frac{2}{10}$.

32. Dr. R. MURDOCH, of Washington, exhibited and described Dr. REID'S **ophthalmometer.**

Dr. J. O. GREEN demonstrated a new electro-magnet for the eye; Dr. C. H. WILLIAMS an apparatus for determining the axis of a cylindrical lens, and Dr. E. JACKSON a modification of the binocular magnifying lenses.

A number of other papers were read by title.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FOURTH QUARTER OF THE YEAR 1896.

By Dr. ST. BERNHEIMER, in Vienna; Prof. C. HORSTMANN, in Berlin; and Dr. P. SILEX, in Berlin;

with the assistance of

Dr. S. M. Burnett, Washington; Dr. Dantone, Rome; Dr. Herrnheiser, Prague; Prof. Hirschmann, Charkow; Dr. P. von Mittelstädt, Metz; Dr. Sulzer, Geneva; Dr. L. Werner, Dublin; Dr. C. H. A. Westhoff, Amsterdam; Dr. Schiötz and Dr. Ole Bull, Christiania; Dr. R. Greeff, Berlin; Dr. Deus, Berlin; Prof. Da Gama Pinto, Lisbon; and others.

Translated by Dr. Ward A. Holden.

Sections I.–V. Reviewed by Dr. ST. BERNHEIMER.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS. STATISTICAL REPORTS.

498. Nettleship. Introductory address delivered before the Ophthalmological Society of the United Kingdom. *Transactions*, vol. xvi.

499. Transactions of the Ophth. Soc. Un. K. Vol. xvi., London. J. A. Churchill, 1896.

500. New York Ophthalmic and Aural Institute. 27th annual report, 1896. Dr. H. Knapp executive surgeon.

Nettleship's (498) address deals with influences of specialism and he thinks that the best results will be obtained when the staffs of special hospitals are composed of men who also hold office in a

special department of a general hospital. He proceeds to suggest subjects for further study, amongst which may be mentioned: Sympathetic ophthalmia, without perforation; frequency of its occurrence from presence of a foreign body, and blanching of eyelashes in this disease; Detachment of choroid; Angioid streaks in retina; Amblyopia caused by alcohol in non-smokers; Intermittent paralysis of 3d nerve; Pemphigus; Membranous conjunctivitis; Disseminated choroiditis in young adults, of a map-like character, and probably not syphilitic, etc. WERNER.

This volume (499), which has appeared a couple of months later than usual, contains 368 pages with xiii. plates and 74 illustrations. Amongst the plates are two well marked cases of retinitis circinata, some micro-photographs showing the condition of the angle of the ant. ch. in conjunctival hydrophthalmos, and drawings showing the course of degenerated nerve fibres after division of portions of the retina. In addition to an index there is the usual list of communications tabulated under headings: Eyelids, Conjunctiva, etc. There are 64 communications, including the "Bowman Lecture" on vision and retinal perception by H. Snellen and an introductory address by the President, Mr. Nettleship. Abstracts of all the important and original papers will be found in these ARCHIVES. WERNER.

During the year ending Sept. 30, '96, the number of new eye patients treated at the N.Y. Ophthalmic and Aural Institute (500) was 8782. The number of major operations on the eye was 580, including 124 extractions of cataract with one failure. There were 88 uncomplicated extractions without iridectomy and 8 with iridectomy. The others were complicated in some form.

BURNETT.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

501. GALEZOWSKI. On the value of nystagmus in intoxication from chloroform or cocaine. *Rec. d'opht.*, 1896, p. 659.

502. VALUDE. Intoxication from the use of scopolamine. *Ann. d'ocul.*, cxvi., p. 380.

503. DUFOUR. Subconjunctival injections in ocular therapeutics. Lausanne. Bridel and Co., 1896.

504. GABRIELIDES. Note on a case of cyclopia in a pig-embryo. *Ann. d'ocul.*, cxvi., p. 374, and *Arch. d'opht.*, xvi., 10, p. 672.

505. SULZER. Some results of clinical ophthalmometry. *An. d'ocul.*, cxvi., p. 241.

506. KRÜCKMANN. Experimental investigations on the healing of scleral wounds. *Graefe's Archiv*, xlii., 4, p. 293.

507. BERNSTEIN A. S. Subconjunctival injections. *Jour. Amer. Med. Assoc.*, Sept. 12, 1895.

In two cases Galezowski (501) has seen the instillation of cocaine into the conjunctival sac followed by symptoms of intoxication as follows: horizontal nystagmus, symptoms of asphyctic excitation, trembling of the entire body, and fibrillar twitching of the fingers, jaws, and eyelids. In one of the patients, a boy of eleven, operated on for squint, the nystagmus continued for some time in the operated eye.

VALUDE'S (502) patient, a man of sixty-five, instilled a drop of a $\frac{1}{2}$ % solution of hydrobromate of scopolamine into the eye in the morning. Some moments after repeating the instillation at 6 P.M., he was seized with loss of consciousness and delirium lasting twenty-four hours. SULZER.

DUFOUR (503) uses injections of bichloride 1 : 1000 or 1 : 2000 warmed to 40° C, which diminishes the pain. The eye is bandaged for two days, and he has seen no unpleasant effects, while therapeutically he considers these injections of great value and superior to those of salt solutions. SULZER.

The case of cyclopia in a pig-embryo, described by GABRIELIDES (504), is remarkable for the fact that while the combined eyes apparently represented a single eye only, the presence of a double lens left no doubt but that there had been a union of two separate eyes. SULZER.

SULZER (505) determined the astigmatism and the radius of corneal curvature in 1114 eyes. While he finds in general that myopia depends upon a lengthened axis, and not an altered corneal curvature, there are some cases in which the corneal refraction gradually increases. These cases are a transition form between the normal cornea and keratoconus. Such a case was followed for years, being repeatedly measured. Sulzer thinks that such cases may be recognized at the first examination by the following characteristics: the commencement of the trouble at an age of eight to twelve years; slight myopia with reduced acuteness of vision; irregularity of the surface of the cornea, with opalescence of the deeper layers on lateral illumination; slight spasm of accommodation. In general a high curvature of the cornea is

more frequent in myopia than in emmetropia, and more frequent in the latter than in hyperopia. SULZER.

KRÜCKMANN (506) has studied the healing of scleral wounds in one hundred animals of five different species. The sclera was divided with a Graefe knife for a distance of 2–6 *mm.* He found that up to the end of the first day inflammatory processes were predominant, giving place on the second day to degenerative changes. On the third day the reparative process begins, and phagocytosis is noticeable, the new granulation cells taking up pigment and cellular debris. In favorable circumstances the wound may be fully closed by the third day, but usually four to seven days are required.

BERNSTEIN (507) has used cyanide of mercury (1 to 3000) subconjunctivally in seven cases and with much benefit in some instances, he thinks. The diseases were: hypopyon keratitis with ulceration, iritis, keratitis punctata, optic-nerve trouble, probably specific in its origin, tobacco-amblyopia, and choroiditis disseminata. BURNETT.

III.—INSTRUMENTS AND REMEDIES.

508. SIMI. On radiant heat in ocular therapy. *Boll. d'ocul.*, xviii., No. 10.

509. RAMPOLDI. Old and new ophthalmic observations. *Ann. di Ottalm.*, xxv., 6, p. 616.

510. CATTANES. The action of mydrol on the eye; clinical experimental studies. *Ibid.*, xxv., 4, p. 361.

511. SIMI. Ophthalmia among the Auer operatives. *Boll. d'ocul.*, xviii., 11, p. 76.

512. SNELL. A short note on the value of the immediate use of hot water after enucleation of the eyeball. *Ophth. Rev.*, xv., p. 283. (Hot water a good hemostatic after enucleation.)

513. BULLER. The use of the electro-magnet in ophthalmic surgery, with some illustrative cases. *Annals of Ophth. and Otol.*, Oct., 1896.

514. RISLEY. Defective coquille glasses, a frequent cause of additional irritation to weak and inflamed eyes. *Am. Jour. of Ophth.*, Nov., 1896.

515. JENNINGS, J. E. Eucaine hydrochlorate, a new local anæsthetic. *Amer. Jour. of Ophth.*, Dec., 1896.

516. JENNINGS, J. E. An improved skiascope. *Ibid.*, Nov., 1896.

517. HANSELL. Homatropine as a cycloplegic. *Ibid.*, Aug., 1896.

518. JACKSON, EDWARD. Lenses for binocular examination of the eye by oblique illumination. *Annals of Ophth. and Otol.*, Oct., 1896.

519. PINCKARD, C. P. A case of poisoning from scopolamine. *Ibid.*, Oct., 1896.

520. RUST, E. G. A new trachoma forceps. *N. Y. Med. Jour.*, Sept. 12, 1896.

521. JACKSON, EDWARD. The value of homatropine in the diagnosis of ametropia. *Jour. Am. Med. Assoc.*, Nov. 31, 1896.

SIMI (508), following Parent, experimented with radiant heat in its antiseptic effect on corneal infiltrations, with gratifying results. The tip of a Paquelin cautery point was covered with a pear-shaped non-conducting tip having an anterior opening in which was set a small lens of salt crystal, so that the eye was protected from lateral radiation. The cautery point was always held half a centimetre from the cornea. DANTONE.

RAMPOLDI (509), refuting the claim of Secondi to priority in the use of subconjunctival injections of bichloride, states that he himself used iodide of potassium subconjunctivally in 1884, after Rothmund in 1866 made the first injections, using salt solution. DANTONE.

According to CATTANES (510) mydrol in 5–10% solution produces a moderate mydriasis lasting a few hours. The accommodation is scarcely affected, but it has a remarkable effect upon the blood-vessels, the bulbar conjunctiva becoming quite ischæmic for a time. The author believes, therefore, that the drug is useful as a mydriatic for ophthalmoscopic purposes and as an anæsthetic in affections of the conjunctiva, cornea, and iris, although less efficacious than cocaine. DANTONE.

In order to protect the men manufacturing the Auer burner from the strong glow-lights and the emitted heat, SIMI (511) had spectacles constucted each of a red and a green glass; but these soon became heated, and he only obtained the desired result by placing the two glasses a little distance apart so that there was a layer of air between them. DANTONE.

BULLER (513) relates five cases of successful extraction of

pieces of metal from the interior of the eye by means of the electro-magnet. One was from the anterior chamber, one from the sclera near the outer margin of the cornea, which had penetrated into the vitreous and which the forceps had failed to extract. Three were floating in the vitreous. The sixth eye had to be enucleated because of failure to extract the body floating in the vitreous by the magnet. The body was found on examination after enucleation to consist of silica, lime, and carbon, with a slight coating of oxide of iron, which accounted for its feeble reaction to the magnet. BURNETT.

RISLEY (514) has examined and had examined by others a number of packages of smoked coquille glasses, and not one was found in which there was not either a cylindrical, spherical, or prismatic action, often as high as 0.5 D. He recommends plane glasses with parallel surfaces as light protectors, instead of the coquille as commonly used. BURNETT.

JENNINGS (515) has used the new local anæsthetic eucaine and finds that it does not lose its effect by keeping, and may be sterilized without deterioration. It does not cause ischæmia, but on the contrary produces vascular dilatation. There is only a slight dilatation of the pupils, and the accommodation is not affected. There is no drying of the epithelium of the cornea.

BURNETT.

JENNINGS (516) figures a modification of the skiascope, which consists of a chain of lenses like that in a Morton ophthalmoscope, which is turned by the surgeon by means of a rod passing through the axis of a cog-wheel. It has an arrangement for using cylinders in addition. The reviewer thinks he has seen a somewhat similar apparatus of English make. BURNETT.

In HANSELL'S (517) experience, whereof he relates two cases, homatropine cannot be relied upon to completely paralyze the accommodation in young people. BURNETT.

JACKSON (518) describes a modification and improvement of his binocular corneal loupe described sometime ago. It consists of two tubes whose lower ends are joined at an angle of 40 degrees. The lower ends of these tubes are fitted with lenses of 20 or 40 D according to the magnifying power desired. These lenses have surfaces bearing a relation of 6 to 1 in the curvature, the stronger curve being inward. The upper ends of the tubes are fitted with prisms of 20 prism-diopters, with their lenses turned inwards towards each other. These prisms render the diverging pencils of

the tubes somewhat less so, and enable eyes with a slight convergence to focus them on the maculæ of the two eyes. The magnification secured is from 8 to 15 diameters, with the important additional quality of depth to the image. It is made by Wall and Ochs, of Philadelphia. BURNETT.

In PINCKARD'S (519) case, a woman of forty-eight years, who, after a drop of scopolamine solution, 1 gr to ℥ i, was placed in the conjunctival sac, gave evidences of strong intoxication similar to those of atropine, the pulse was accelerated, throat parched and dry, and there were great nervousness and some muscular twitchings, but no mental phenomena. Tension of the eye was markedly increased, + 1. The symptoms lasted 36 hours. She had previously used homatropine with no ill effect; vision normal. BURNETT.

RUST'S (520) forceps for expression in trachoma are a combination of Knapp's and Noyes's, being open at one end and having one roller instead of two. BURNETT.

JACKSON (521) thinks that homatropine properly applied—a drop on the upper portion of the cornea every five minutes for 5 or 6 times—is capable of producing a complete paralysis of accommodation in about an hour. It is less likely to produce general toxic effects or an outbreak of glaucoma or conjunctival irritation than other mydriatics. Its effects pass off much sooner and more completely than any other mydriatic. BURNETT.

IV.—ANATOMY.

522. PACETTI. On the nucleus of origin of the abducens nerve. *Researches made in the laboratory of normal anatomy at the R. Univ. di Roma*, vol. v., 2., p. 121.

523. BIETTI. Contribution to the study of the elastic tissue in some parts of the lid. *Arch. di Ottalm.*, iv., 1–3, p. 1.

524. ALLEN, S. N. Cyclopia. *Med. Record*, Aug. 15, 1896.

In the brain of an insane person who had had a congenital paralysis of the abducens, PACETTI (522) found in the reticular formation, midway between the nucleus of the abducens and the nucleus of the facialis and near the motor nucleus of the trigeminus, a group of ganglionic elements connected by fibres with the abducens nucleus, which the author would designate as an accessory nucleus of the abducens. Since this accessory nucleus is not found in all brains, its presence must indicate a faulty development of the brain which would account for the idiocy. The

author also found this condition of the abducens nucleus in another idiot.

BIETTI (523) describes the location of elastic fibres which he has found in the tarsus of the upper lid and about the walls of the lachrymal canaliculi. DANTONE.

ALLEN (524) reports and figures a case of cyclopia in an infant which lived a half hour after birth. No account of an anatomical examination is given. BURNETT.

V.—PHYSIOLOGY.

525. DE BONO. The chronological law in the perception of colors. *Arch. di Ottalm.*, iv., 1–3, p. 23.

526. OVIO. Interpretation of the law respecting the relation of the sizes of sharp images and blurred images. *Rev. génér. d'ophtal.*, 1896, No. 12.

527. KATZ, R. Some words on the perception of light in the periphery of the eye. *Arch. d'opht.*, xvi., No. 11, 1896.

528. DOLGANOW. On the ocular changes following ligation of the gall duct. (Experiments on hepatic ophthalmia.) *Wratsch*, 1896, No. 48–49.

529. DOLGANOW. On the action of eucaine on the eye. *Wratsch*, 1896, No. 51.

530. CRZELLITZER. The Tscherning theory of accommodation, a comprehensive representation after Tscherning's articles the author's experiments. *Graefe's Archiv*, xlii., 4, p. 36.

531. NAGEL, W. On compensatory torsion of the eye. *Zeitschrift f. Psychol. u. Physiol. d. Sinnesorganen*, xii., 5 and 6, p. 331.

532. ULRICH. On the channels of exit of the vitreous. *Wiener klin. Wochenschr.*, 1896, No. 53.

533. HELMHOLTZ. Handbuch der physiologischen Optik, parts 10–17. Hamburg and Leipsic, 1895–96. L. Voss.

534. SNELLEN. Notes on vision and retinal perception, being the Bowman lecture for 1896. *Trans. Ophth. Soc. Un. K.*, xvi., 1.

535. OLIVER. Some of the inefficiencies in the methods ordinarily employed by railway surgeons for the detection o subnormal color-perception (color-blindness). *Annals of Oph. and Otol.*, Oct., 1896.

536 HARLAN and WOODS. Examination of the eyes in the public schools of Baltimore. *Jour. Amer. Med. Assoc.*, Dec. 5, 1896.

De Bono (525), using Hipp's chronoscope and Förster's photometer, made experiments as to the time elapsing between the action of a given color on the retina and the beginning of perception. It was found that the middle of the spectrum most quickly leads to perception, yellow requiring 0.405 sec., red 0,663 sec., and violet 0.716 sec.

Katz (527) examined the eyes of four dogs which had died after ligation of the choledoch duct. The animals lived sometimes as long as 100 days. Anæmia came on, due mostly to the mucoid degeneration of the bone marrow. The liver became cirrhotic, and parenchymatous changes appeared in the kidneys. The intestinal tract became catarrhal with a tendency to ulceration and hemorrhage. The icterus diminished after a time. The animals decrease in weight and finally die from disturbances of metabolism. The eyes exhibit inflammatory and degenerative changes. In the connective tissue the nuclei increase. In the vascular system are found congestion, swelling of the endothelium, proliferation in the vessel walls, dilatation of the perivascular spaces, extravasations, and exudations. In the nervous tissues are found various sorts of degeneration in the protoplasm of the ganglion cells, changes in the nuclei, and enlargement of the intercellular spaces. All these changes cannot be traced to their initial causes, but they do not seem to depend altogether upon disturbances of nutrition. Hirschmann.

Dolganow (529) studied the action of 1 % solution of hydrochlorate of eucaine upon the healthy eye. Anæsthesia came on in $1\frac{1}{2}$–$2\frac{1}{2}$ minutes and lasted 5-13 minutes. The instillations are painful. The pupil is not much affected, the accommodation not at all. The tension is lowered somewhat and diffusion from the conjunctival sac into the anterior chamber is hastened. Eucaine possesses no advantages over cocaine.

Crzellitzer's (530) conclusions as to his and Tscherning's work on accommodation are as follows. The breadth of accommodation is less for the marginal rays than for the central, proving that the surfaces of the accommodated lens must be more refractive in the centre than at the periphery. The refractive power is less at the periphery in all surfaces flattened at the periphery, as, for example, in hyperboloids by rotation. The reflection from the anterior surface of the accommodated lens shows that its shape must be nearly that of a hyperboloid. Traction on the zonula does not flatten the lens in toto, but changes its previously

spherical surfaces in such a way that the curvature increases in the centre and diminishes in the periphery. It is therefore probable that during accommodation there is traction on the zonula which renders the spherical surfaces of the lens hyperbolic.

With the appearance of the last seven parts of HELMHOLTZ'S (533) physiological optics is concluded the second edition of this classic work. The last chapters were edited by Arthur Koenig after the author's death. Little was changed from the first edition, according to the author's wish. But the résumé of the entire literature of physiological optics up to 1892 is not only new but is presented in a most admirable and comprehensive manner.

SNELLEN (534) discusses, in this lecture, the question of linear and square measurement in the determination of V, and color perception, also the effect of the degree of illumination on the acuity of vision, and concludes with a study of after-images.

Although the value of visual perception is not *fully represented* by the linear or even by the square measurement of the retinal image (acuteness of V diminished towards periphery of fovea, and minute movements of the eye taking place), nevertheless the linear measurement fully answers the wants of clinical work and is rapid and simple. Within certain limits it is found that letters possessing the same superficies, whether oblong or square, can be recognized at the same distance, and this holds good for colored letters; and therefore it is suggested for simplicity that color should also be measured by the linear method, as it is subject to the same rules as form, in this respect. For accurate measurements of V, it is necessary to determine the degree of illumination of the standard types, and this is very difficult especially in daylight. Careful experiments were made by two of Professor Snellen's pupils, to determine the effect of the illumination on V both by artificial light and by daylight. On account of difference in quality and pressure of gas, a special arrangement with benzine was used, and in the daytime the degree of illumination on the surface of the test types was measured by L. Weber's photometer, using test types on paper tinted the same color as the flame with which the daylight is compared. When the illumination is intense, considerable changes are hardly perceived. *The maximum of vision is reached at about fifty standard candles*, while any diminution is clearly perceived. The divergence of the results of previous experimenters is alluded to, and it is pointed out that

$\frac{4}{5}$ does not always represent full vision, and that the maximum of each individual acuity should be taken as basis. Two great difficulties in making these experiments are the adaptation of the eye and keeping the illumination constant. The eye should be covered when not being tested. The results are shown in curves which are similar for linear and square measure. The curve of binocular vision is higher than for monocular, but never so much as double the height. No definite law, expressing the relation between the degree of illumination and the visual acuity, could be made out.

As a result of these studies Snellen has had his operating theatre painted completely black, with one window facing the north, care being taken by the operator not to look at the window, so as to avoid alterations in the adaptation.

The after-images of light and color were studied in absolute darkness, the observation screen being illumined by an electric flash reflected on to it by a concave mirror, the flash being of course hidden from the observer. The following phenomena were observed: the screen lights up with the flash, the intensity rapidly increasing and then diminishing; during the decrease the color seen is the opposite to that of the screen; this occurs with all colors if sufficiently saturated. The whole thing lasts one second. "The feebler the exciting, the longer the after-image" is only true because, as the white light, the color becomes more saturated. A third phase follows, of longer duration, in which a dull reddish-brown is seen; there is then anæsthesia for objective light in this area, which will become visible at once if the eye moves. After this there is a disappearance and reappearance of the same phenomena. If a feeble light be looked at continuously, it slowly fades away and *gradually* reappears, differing from the sudden reappearance due to motion of the eye. According to Hering this is due to the reciprocal effect of assimilation in the surrounding retina. WERNER.

OLIVER (535) here reiterates what he has insisted upon on various occasions, that in testing for color-blindness in railway employés, the near test by wools is not sufficient. The tests should be made at a distance and by the means and under the circumstances of atmosphere and general surroundings in which the lights are usually observed by the person under examination. All employés who are suspected of intoxication from tobacco or alcohol should be subjected to frequent examinations.

BURNETT.

The system used by HARLAN and WOODS (536) was imperfect, owing to the conditions under which the examinations of the school children were made, but some important information was elicited. 53,333 pupils were tested as to their vision—43 % had $\frac{20}{20}$ in each eye, and, in addition, 39 % had $\frac{20}{20}$ in the better eye; 15 % came between $\frac{20}{30}$ and $\frac{20}{200}$, and 0.56 % had less than $\frac{20}{200}$ in the better eye. The largest percentage of bad vision was in the lowest and highest grades. BURNETT.

Sections VI.–XI. Reviewed by PROF. HORSTMANN.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

537. KAYSER. On the operative treatment of high myopia. *Württemb. Med. Corr.-Blatt.*, 1896.

538. LUCCIOLA. Surgical treatment of astigmatism. *Arch. d'opht.*, xvi., 10, p. 630.

539. PERGENS. Relation between unilateral astigmatism and unilateral ptosis. *Presse méd. belge*, May 3, 1896.

540. LAWFORD and CROSS. A discussion on the operative treatment of high myopia. *Brit. Med. Journ.*, 1896, No. 1863, p. 631.

541. JACKSON. The correction of anisometropia. *Amer. Journ. of Ophth.*, Oct., 1896.

KAYSER (537) reports on twenty-eight cases of discission of the lens in cases of myopia between 12 and 22 D. The patients ranged in age from nine to forty-six years. In eight the operation was done in both eyes. One failure apart, an increase in acuteness of vision was obtained in almost every case.

LUCCIOLA (538) undertook, in ten cases, to correct the corneal astigmatism by making a corneal incision. He found that, after a single incision, the decrease in astigmatism mostly did not exceed 1. D, but the patient experienced a relatively greater increase in the facility of seeing. *Contrary to the changes in corneal curvature after iridectomy and extraction, incision of the cornea without escape of aqueous leads to an increase in the radius of curvature of that meridian in which the incision lies.* V. MITTELSTÄDT.

JACKSON (541) points out the fact that the difficulty in correcting anisometropia does not lie in the difference in the sizes of the retinal images so much as in the prismatic action of the stronger lens when the eyes are used other than in direct vision. All lateral fixation is liable to be accompanied either by double

images or a muscular strain to prevent them. It is a matter, however, that can only be settled by the experience of each individual. In every case the lenses should be worn as close to the eyes as possible, as this reduces the prismatic effect to its minimum. BURNETT.

VII.—LIDS.

542. PALERMO. On the etiology of chalazion. *Annal. di Ottalm.*, xxv., 5–6, p. 481 and 559.

543. WINTERSTEINER. Cysts of the lid margin. *Arch. f. Augenh.*, xxxiii., supplementary number, p. 115.

544. SCHIMANOWSKY. On congenital cysts of the lower lid with microphthalmus. *Wjest. Ophth.*, xiii., 4–5.

545. TROUSSEAU. Continued favorable results from some operations for epithelioma of the lids and conjunctiva. *Arch. d'opht.*, xvi., 10, p. 625.

546. SGROSSO. The marginoplastic of Prof. Scimeni in the treatment of trichiasis and entropium. *Lav. d. clin. ocul. d. R. Univ. di Napoli.*, iv., 4, p. 317.

547. TERSON. The treatment of senile ectropium. *Ann. d'ocul.*, cxvi., p. 441, and *Arch. d'opht.*, xvi., 12, p. 761.

548. GOLDZIEHER. On a case of bilateral congenital coloboma of the lid. *Centralbl. f. prakt. Augenheilk.*, 1896, p. 359.

549. WOLFF. The advancement of the levator with section of its insertion. Two new methods of operating for congenital ptosis. *Arch. f. Augenheilk.*, xxxiii., p. 125.

550. ALT. Xanthelasma tuberosum or molluscum contagiosum? *Amer. Journ. of Ophth.*, Nov., 1896.

551. SMITH, H. E. Symblepharon. *Annals of Ophth. and Otol.*, Oct., 1896.

552. THEOBALD, SAMUEL. A novel way of wearing an artificial eye. *Amer. Journ. of Ophth.*, Aug., 1896.

In a paper of 100 pages PALERMO (542) discusses the present views on chalazion, and the experiments and investigation made by himself and others to establish its nature. DANTONE.

According to WINTERSTEINER (543) the cysts of the lid margin arise from the lymph-vessels or the glands there located. The cysts contain a clear, colorless, odorless fluid, with sulphate of lime crystals; the walls consist of tense fibrillar connective tissue; and the lining is epithelium.

TROUSSEAU (545) reports on six cases of advanced epithelioma affecting the lids or the conjunctiva. In one case the lachrymal sac was involved, and in another the cornea. The lid operations, which were not plastic procedures, were followed by favorable results, and not a single recurrence has taken place, although the patients have been under observation for from three to eight years. v. MITTELSTÄDT.

SGROSSO (546) has made with satisfactory results six entropium operations after the method of Scimeni, who several years ago modified the Jaesche-Arlt operation. In this operation a flap of skin parallel to the lid margin is loosened and set into the split in the lid margin, but its end attachments are not cut through until it has healed in. DANTONE.

TERSON (547) does the operation for senile ectropium in the following way: After ectropionizing the lower lid, the thickened conjunctiva is removed in a wedge-shaped mass from commissure to commissure. Near the outer commissure an equilateral triangle of skin is removed, with its perpendicular side toward the commissure. Silk sutures are then introduced. SULZER.

GOLDZIEHER (548) observed a case of congenital right-angled coloboma of both upper lids in a girl of nine. An operation was successfully done.

ALT (550) has made a histological examination of two cases of xanthelasma tuberosum in addition to those made some years ago and published in these ARCHIVES (vol. vii.). He still adheres to his opinion, that the change is a degeneration of the epithelium of the sebaceous glands. From a histological examination of a case of molluscum contagiosum, he is inclined to think there is a close connection between these and xanthelasma. BURNETT.

In the case reported by SMITH (551), there was an extensive symblepharon below the cicatrix invading the cornea in its lower half. A careful dissection was made, relieving all adhesion and tension, and the denuded space on the ball, which was very large, was filled in with the conjunctiva taken from a rabbit. The flap united perfectly, and the motility of the eye was restored.

BURNETT.

As a curiosity, THEOBALD (552) relates the case of a patient who, on account of the shrinking of the conjunctival sac and almost complete disuse of the orbital cavity, wore his artificial eye outside the lids in the manner of the monocle as worn by some Englishmen. BURNETT.

VIII.—LACHRYMAL APPARATUS.

553. SCHIMANOWSKY. On extirpation of the tear-sac. *Wjest. ophth.*, xiii., 4–5.

554. BOUCHERON. Antistreptococcus serum in the treatment of rebellious purulent dacryocystitis due to streptococci, and of other ocular streptococcus inflammations. *Ann. d'ocul.*, cxvi., p. 379.

555. DUMONT. Dacryops. *Journ. méd. de Bruxelles*, April, 1896.

556. MCCASSY, T. H. Lachrymal disease. *Journ. Amer. Med. Assoc.*, Dec. 19, 1896.

SCHIMANOWSKY (553) recommends the extirpation of the tear-sac in all obstinate cases of dacryo-cystitis.

According to BOUCHERON'S (554) experience, streptococcus dacryo-cystitis disappears in a few days, together with the accompanying conjunctivitis and rhinitis, when three or four injections of 5 *ccm* of streptococcus serum are made at intervals of several days. He also recommends these injections as a prophylactic measure before extraction, when suppuration exists in the sac. SULZER.

In the treatment of strictures of the nasal duct, MCCASSY (556) returns to the silver canulated style. The head can be hidden in the sac, and remain for years without causing any disturbance.
BURNETT.

IX.—MUSCLES AND NERVES.

557. PARINAUD. History of strabismus and its treatment. *Ann. d'ocul.*, cxvi., p. 401.

558. STRAUB. Squinting in conditions of Amblyopia. A provision for assisting nature. *Genees en Heelkunde*, 1896, p. 88.

559. PANAS. Double external ophthalmoplegia hereditary in six members of a family. *Arch. d'opht.*, xvi., 12, p. 721.

560. GOURFEIN. Double ophthalmoplegia hereditary in six patients of a single family. *Ann. d'ocul.*, cxvi., p. 447.

561. ROCHON-DUVIGNEAUD. Some cases of paralysis of all the orbital nerves (ophthalmoplegia with amaurosis and anæsthesia in the domain of the ophthalmic) of syphilitic origin. *Arch. d'opht.*, xvi., 12, p. 746.

562. PROCOPOVICI. On congenital bilateral paralysis of the abducens and facialis. *Arch. f. Augenheilk.*, xxxiv., p. 34.

563. SILEX. On progressive paralysis of the levator. *Ibid.*, xxxiv., p. 20.

564. MAXWELL and others. A discussion on precision in squint operations. Ophth. section, Brit. Med. Assoc. *Brit. Med. Jour.*, Sept., 1896, p. 818.

565. MAXWELL, P. W. The effects of nasal obstruction on accommodation. *Ibid.*, p. 825.

566. AHLSTRÖM. On recurrent oculomotor paralysis. *Ophth. Review*, XV., p. 177.

567. WOOD, CASEY A. The field of monocular fixation and its relation to heterophoria. *Jour. Am. Med. Assoc.*, Nov. 28, 1896.

568. VALK. An operation for shortening the ocular muscles in asthenopia, etc. *N. Y. Med. Jour.*, Nov. 7, 1896.

PARINAUD (557) says that the history of strabismus and its treatment started on a false principle which originated in the result of tenotomy, and consisted in the muscle theory of squint. Graefe is its major prophet, although not its originator, and it was Jules Guérin who in 1841 stated that the theory of squint must be reconciled to the operative results, and that Buffon's innervation theory must yield before the muscle theory. Boehm, a pupil of Dieffenbach's in 1845, separated convergence from lateral motions. In 1842 Bonnet had substituted tenotomy for myotomy and improved the technique. The supporters of the muscle theory were forced to accept these better results, particularly since the results of the advancement introduced by Guérin seemed to point in the same direction.

In conclusion, PARINAUD shows that the operative procedures do not act solely on the muscular apparatus, and that their results do not contravene the innervation theory.

PANAS (559) reports on an observation by Gourfein of congenital complete paralysis of the extrinsic and levator muscles, which was found in the paternal grandmother, the father, and four sons, while both daughters were normal. Besides a marked flattening of the arch of the brows, there was rotary nystagmus. The acuteness of vision was very much reduced. In one case there was a white excavated disc, but no other ophthalmoscopic abnormality. Pupillary reaction and accommodation were normal. The cause of the affection is obscure. Gourfein regards it as an hereditary amyotrophia and not as a nuclear affection.

v. MITTELSTÄDT.

In ROCHON-DUVIGNEAUD'S (561) first case there appeared ptosis, immobility of the right eye, and anæsthesia of the re-

gion supplied by the frontal nerve, besides optic neuritis and diminution of vision. A diagnosis of syphilitic periostitis in the region of the optic foramen and sphenoidal fissure was made, and under the use of mercury and iodide of potassium the symptoms soon disappeared entirely. In two other cases there were similar paralytic conditions, slight papillitis, and complete amaurosis in the affected eye. The cornea was anæsthetic, the pupil dilated, and only reacting consensually. Lachrymal secretion normal. No exophthalmus. Specific treatment caused the paralyses to disappear, but did not prevent blindness from optic-nerve atrophy. In a fourth case, in which the optic nerve was not involved, there was complete recovery. The sharply limited extent of the paralyses, the lack of nutritive disturbances in the cornea which would have indicated involvement of the ganglion of Gasser, and the absence of exophthalmus exclude both an intracranial and an orbital gummous affection, and point toward the optic foramen and the sphenoidal fissure as the sole seat of the disease.

v. Mittelstädt.

Procopovici (562) observed in a girl of seven a left congenital complete paralysis of the facial nerve, a right incomplete facial paralysis, and a complete paralysis of both abducens nerves. He believes that the entire condition here depends upon an irregular disposition of the nerve nuclei.

Silex (563) reports on two cases of progressive paralysis of the levator in women respectively sixty-two and sixty-eight years of age. The first was healthy until the first symptoms of paralysis appeared four years before and gradually became complete. The cause was probably a slowly progressive atrophy of the levator, and this view is supported by the fact that in the ptosis operation a piece of the levator was removed, and was found to show an increase in fat and connective tissue, and a degeneration of the muscle fibres.

P. W. Maxwell (564) read a paper giving conclusions drawn from analysis of 179 operations, which are not suitable for abstraction. The angle γ in 51 cases averaged nearly 2° less in the squinting eye, and vision diminished with the angle γ. Probably a new fixation point is established. In Swanzy's operation for advancement the primary result is greater than in De Wecker's, but the secondary is less. Maxwell has, in a few cases, endeavored by means of a special instrument to gauge the amount of advancement. He believes that the angle γ becomes positive

and more equal to the sound eye after operation, showing that the squinting eye co-operates with its fellow even when full binocular vision does not occur. Latent relative convergence or divergence may modify the effect of an operation. In most of the cases the degree of squint was more than 3° for each D of H. Glasses produce less than the reduction calculated as above.

LANDOLT drew attention to the frequently inaccurate knowledge of the motor apparatus and the nature of strabismus. It should be remembered that alterations in "innervation," and not changes in the muscles, are the primary causes. The centre of mobility of the eye is not a fixed point, and its position is influenced by the combined actions of muscles, hence the disadvantage of tenotomy, which allows the centre to fall forward. Precision in the operation is only obtained by nature. Binocular vision is the surgeon's great ally.

BERRY thought precision need not be attempted, and that a little convergence should be left.

BICKERTON thought that precision, if possible, would be best obtained by Stevens's method of tenotomy. WERNER.

MAXWELL (565) examined the nasal conditions in all asthenopes, where the vision was good and the refraction error low, and he came to the conclusion that obstructed *breathing* gives rise to asthenopia. He cites five cases which he believes to have been relieved or cured by nasal treatment. Rayner Batten agreed with these views, but, moreover, thought that nasal conditions frequently produced myopia, and were frequently associated with a crescent on the nasal side of the disc. He finds that in nasal obstruction forced expiration produces slight myopia, forced inspiration slight hypermetropia. WERNER.

AHLSTRÖM'S (566) patient, a healthy man, aged fifty, suffered from recurrent attacks of paralysis of left third nerve, including the intraocular muscles. The attacks were accompanied by severe pain in left side of head, and *tenderness* on pressing eyeball into orbit. There was a slight discharge from left *nostril*, which ceased with onset of eye trouble. A nasal douche removed headache and eye symptoms in subsequent attacks. The author believes that the catarrhal inflammation of the frontal sinus caused reflex circulatory disturbance in the region of the oculo-motor region. (Would not direct pressure be a more plausible explanation? See Holmes's paper, these ARCHIVES, XXV., p. 460.—L. W.)
WERNER.

Wood (567) has devised a method of subjectively determining the field of monocular fixation by means of the perimeter. He has short words printed on a strip of paper to be fitted on the inner side of the arc of the perimeter. These words are situated at places marking the degrees from the point of fixation. The most remote letters made out will indicate the outer limits of the field of fixation for that eye. He finds that the limit of the field of monocular fixation determined in this way differs but little from that determined by Landolt. As each eye can be taken separately, the disturbance of muscular balance in heterophoria can be easily ascertained and registered. Burnett.

Valk's (568) method of shortening the ocular muscles is to take a tuck in it without separating it from its scleral attachment, as follows: The conjunctiva is opened along the length of the muscle, and the muscle separated from the surrounding tissues by two ordinary strabismus hooks pulling in opposite directions. A kind of double hook, with the two ends held apart by a spring, is then introduced under the tendon, serving to keep the tissues on the stretch. A catgut suture, o. or oo., is then passed first through the scleral end of the tendon and, passing under it, is brought out from within at that place on the muscle where it is deemed best according to the effect desired; passing over the muscle, it is inserted from without in at the lower edge and, passing under the muscle, brought out at the scleral end. The suture is then tied, making a fold in the muscle. Twenty cases are related in which this method has been tried. Burnett.

X.—ORBIT AND NEIGHBORING CAVITIES.

569. Königstein. Notes on the anatomy and physiology of the orbit. *Beiträge z. Augenheilk.*, xxv., p. 1.

570. Lodato. Fibro-myoma of the orbit. *Arch. di Ottalm.*, iv., 3–4, p. 120.

571. Sgrosso. Orbital dermoid with remains of ocular tissues. *Lav. d. clin. ocul. d. R. Univ. di Napoli*, iv., 4, p. 323.

572. Sureau. Orbital tuberculosis. *Ann. d'ocul.*, cxvi. p. 374.

573. Armaignac. Sero-sebaceous cyst of the orbit. *Ibid.*, p. 383.

574. Lancial. Facial and ophthalmic phlebitis cured by the early destruction of the angular vein and infraorbital structures by means of the thermo-cautery. *Ibid.*, p. 370.

575. ABADIE. Nature and surgical treatment of exophthalmic goitre. *Arch. d'opht.*, xvi., 2, p. 667.

576. BELT, E. OLIVER. Sponge grafting in the orbit for the support of artificial eye. *Journ. Amer. Med. Assoc.*, Nov. 7, 1896.

577. SATTLER, ROBERT. Excessive hemorrhage after enucleation of eyeball. *Ibid.*, Nov. 21, 1896.

Angelucci removed an almond-sized tumor from the upper part of the orbit, where it has existed for thirteen years. LODATO (570), who examined the growth, found it to be a myoma composed of unstriped-muscle fibres. The three other cases of orbital myomata reported were all of the striped-muscle variety. The author assumes that the growth originated in the groups of unstriped-muscle fibres found in the orbit by many observers.

DANTONE.

SGROSSO (571) describes the orbital contents of a pig that was born blind. In place of an eye was a dermoid tumor in which remains of muscular tissues and of a rudimentary optic nerve were found. DANTONE.

In a case of anthrax pustule of the upper lid in a man of nineteen, LANCIAL (574) observed, immediately after the appearance of the swelling of the lid and the chemosis, signs of beginning thrombosis of the facial vein, and burned through this vessel and the tissue of the inner angle of the orbit, thus preventing thrombosis of the ophthalmic vein and infection of the orbit.

SULZER.

According to ABADIE (575) Basedow's disease is due solely to an affection of the vessel-dilating fibres of the cervical sympathetic. The enlargement of the thyroid is a secondary symptom which may be insignificant even with exophthalmus of high degree and considerable tachycardia. The contrary may also be the case. From this we are warranted in believing that section of the cervical sympathetic above the middle ganglion or removal of the latter would favorably affect the exophthalmus. This operation was performed by Jaboulay, when removal of the thyroid had been unsuccessful, and permanently relieved the exophthalmus.

In the cases in which the latter is excessive, threatening the destruction of the cornea, this operation is certainly indicated. The transient results after extirpation of the thyroid depends, in Abadie's opinion, upon the simultaneous removal of a portion of the sympathetic. v. MITTELSTÄDT.

BELT'S (576) operation consists in removing the eye by the ordinary process of enucleation under strict asepsis. After hemorrhage is arrested, the socket of Tenon's capsule is washed out with formalin solution 1 to 1000. A globe of fine sponge ¾ the size of the ball is then inserted, after having been previously sterilized in a 5 % solution of formalin. The conjunctiva is brought together over it and sutured. In a few weeks the sponge is filled with new tissue which in time becomes firm. The sponge fibres are apparently absorbed. BURNETT.

Of the two cases of excessive hemorrhage after enucleation reported by SATTLER (577), the first was a "bleeder," 16 years of age. In spite of all sorts of compresses, hypodermics, etc., the bleeding continued, the orbital cavity was filled, and its contents protruded like a large mass of sarcomatous material. There was fever, delirium and great prostration. A part of the mass and some of the edges of the lids finally sloughed. It was four weeks before the conjunctiva finally fell back in place. In the second case, not a bleeder, the hemorrhage came on some hours after enucleation and was controlled with difficulty only on the fourth day. The patient was much exhausted. BURNETT.

XI.—CONJUNCTIVA, CORNEA, SCLERA, ANTERIOR CHAMBER.

578. GELPKE. Acute epidemic conjunctivitis and its micro-organism (Bacillus septatus). *Graefe's Archiv*, xlii., 4 p. 97.

579. ROMIÉE. The purulent ophthalmia of the new-born. *Le Scalpel*, 1896, Feb. 2.

580. VILLARD. The bacteriology of granular conjunctivitis; general review. *Montpellier méd.*, 1896, March 5.

581. CAZALIS. A bacteriological study of granular conjunctivitis. *Thèse de Montpellier*, 1896.

582. LEBER. On the pathology of trachoma. *Report of the 25th meeting of the German Ophth. Soc.*, 1897, p. 156.

583. HIRSCHMANN. A case of primary syphilitic affection of the conjunctiva. *Wiener klin. Woschenschr.*, 1896, No. 52.

584. LAGRANGE. Lepra of the bulbar conjunctiva. *La presse méd.*, 1896, April 8.

585. DE BECK. Subconjunctival cysts. *Annals of Ophth. and Otol.*, Oct., 1896.

586. KEYSER. Double pterygium on one side in a young subject. *Ibid.*

587. HIGGINS F. W. Œdema of the conjunctiva. *Journ. Amer. Med. Assoc.*, Nov. 21, 1896.

588. MACLOCHLAN, D. A. Pemphigus conjunctivæ—a case. *Homœpathic Eye, Ear, and Throat Journ.*, Feb., 1896.

In two villages near Carlsruhe, GELPKE (578) observed an extensive epidemic of conjunctivitis, with great swelling of the lids, with a watery and, later, muco-purulent secretion. There were marked photophobia and pain. The retrotarsal folds were swollen, of a dark red color, and dotted with hemorrhages. Later the conjunctiva became rough and exhibited folds and follicles. The hyperæmia and swelling extended to the bulbar conjunctiva, and led to perikeratic injection, and later to numerous marginal punctate infiltrations of the cornea. The affection was very contagious, and lasted eight to fourteen days, rarely leaving complications. Cultures of the secretion led to the discovery of a bacillus which probably caused the disease. This was aërobic, and grew in various media, provided they were mildly alkaline. The bacillus proliferated by division and by spore formation. Inoculations on rabbits led to no results, but these were sometimes successful on the human conjunctiva. Gelpke proposes to designate the bacillus as "Bacillus septatus," or "Bacillus septatus conjunctivitidis epidemicæ." (To prevent further confusion in a matter already sufficiently complicated, it may be noted here that all who have commented on Gelpke's paper have agreed in believing that the bacillus he describes is none other than the innocent xerosis or pseudo-diphtheritic bacillus, which may be cultivated from almost any conjunctival secretion. The Weeks bacillus, which the clinical histories would lead one to believe to be the cause of the epidemic, is much smaller than the xerosis bacillus, and is easily overlooked in the secretion; furthermore, since the Weeks's bacillus grows less readily in cultures than the other, it might soon be lost sight of when cultures alone were studied.—TRANSLATOR.)

ROMIÉE (579) is a decided opponent to the use of nitrate of silver for the purpose of preventing blennorrhœa neonatorum. He cites four cases in which the employment of Credé's method was followed by opacities in the lower half of the cornea, which persisted for months.

HIRSCHMANN (583) observed a hard tumor in the right upper

lid of a man of thirty-seven, which reached to the orbital margin. Corresponding to the tumor there was an ulcer of both tarsal and bulbar conjunctiva at the fornix. The patient was supposed to have been infected by using a soiled towel. Iodoform was dusted on and yellow-oxide salve applied, the tumor and ulcer disappearing, but a secondary rash came on later.

In De Beck's (585) case the cysts were found inside of the lower lid, near the inner canthus, of a colored girl of fifteen years —one oblong, 15 *mm* long by 5 *mm* diameter; the other pear-shaped, 10 *mm* long by 6 *mm* in diameter. The larger one was removed entire, the other collapsed. The conjunctiva over them was movable. The one examined was lined with a single layer of endothelial cells. It seems probable that these cysts are derived from the lymph vessels, most likely by a plugging of their calibre, and subsequent dilatation. Burnett.

Keyser (586) describes and pictures an unusual form of pterygium having two apices on the same side—the outer. It was very large, covering nearly one half the cornea. It was loosened from its corneal attachment, and tucked under the conjunctiva some little distance from the corneal edge, and the denuded space on the sclera filled by conjunctival flaps from above and below. Burnett.

In the case reported by Higgins (587), a man of twenty-two years, suffering with albuminuria, had an excessive and long-continued chemosis of the conjunctiva of both eyes. The cornea was hidden from view, and the eyelids could not be closed over the protruding membrane. No drug had been administered which was likely to produce such a condition. There were also changes in the choroid. The patient died not long after. Burnett.

Maclochlan (588) reports an interesting case of what seems to be true pemphigus of the conjunctiva. When seen, the disease was in the second stage, and there was almost complete union between the eyeball and lids in both eyes. In one eye there was an ulceration of the cornea. On the conjunctiva that was still visible there were the ulcerations with greyish deposits which are characteristic of the disease. The affection had existed nine months when first seen by Maclochlan. There were also bullous eruptions in the mouth and pharynx, the naso-pharyngeal passage being almost closed from the cicatricial contraction. It had also invaded the prepuce and possibly the rectum, but the skin was everywhere intact. The process was watched as it appeared in

the mouth. There were first yellowish-gray vesicles, slightly raised, filled with turbid serum. These broke before being fully formed, leaving a raw but scarcely sensitive surface which cicatrized in from a few days to as many weeks. General health good.

BURNETT.

589. BOCCI. Panophthalmitis, exenteration of the ball, cerebro-spinal meningitis, due to the diplococcus of Fraenkel.

590. DE LIETO-VOLLARO. On colloid in the corneal epithelium. *Lav. d. clin. ocul. d. R. Univ. d. Napoli*, iv., 4, p. 347.

591. STEVENSON. Treatment of corneal opacities by electrolysis. *Brit. Med. Jour.*, Sept., 1896, p. 826.

592. DE SCHWEINITZ. Incised wound of the corneo-scleral junction; prolapse of the iris; blood-staining of the cornea. *Phila. Polyclinic*, Sept. 5, 1896.

593. BAKER, A. R. Dermoid tumors of the cornea. *Jour. Am. Med. Assoc.*, Oct. 17, 1896.

In BOCCI's (589) case of purulent infiltration of the cornea which in a short time passed over into panophthalmitis, death followed five days after exenteration of the ball from cerebro-spinal meningitis. Blood and various tissues removed from the body showed that the cause of the disease was the Fraenkel pneumococcus. DANTONE.

DE LIETO-VOLLARO (590), after carefully examining a case, concluded that colloid in the cornea is a product of the epithelium and arises from the degeneration of the cell elements.

DANTONE.

STEVENSON (591) has had good results from this method. He applies the kathode in the form of a small silver *rod* with rounded end to the cornea, using a current of $\frac{1}{4}$ to $\frac{1}{2}$ a m. amp. Faint nebulæ which have resisted ordinary treatment are disposed of in six to ten applications.

HOLMES SPICER had seen remarkable results from the treatment in old cases of interstitial keratitis. He used an electrode with a small metallic *cup* at its end, to which a small globule of mercury was adherent. The mercury secured better apposition.

WERNER.

The interesting feature of the case of DE SCHWEINITZ (592) is the staining of the cornea, which remained after the absorption of the blood from the anterior chamber. The cornea assumed a brownish-green color except a small rim 2 *mm* in diameter at the circumference. An account is given of other cases and the ex-

amination of the condition by the microscope by T. Collins and Weeks, showing the discoloration to be due to granules of hematoidin. BURNETT.

BAKER (593) records two cases of dermoids of the cornea, one 1 inch by ½ inch and studded with black hairs. It was pedunculated and occupied the lower outer half of the cornea. It was peeled off and left transparent cornea beneath. The other had three small tumors on the left cornea, two at the outer sclero-corneal margin; the third extended as a line almost perpendicularly across the pupils at the centre of the cornea. They were separated from each other by clear cornea. They were all removed and fairly good vision restored—$\frac{20}{200}$. BURNETT.

Sections XII–XXI. Reviewed by DR. SILEX.

XII.—IRIS.

594. KARPLUS. Reflex iridoplegia in hysterical attacks. *Wiener klin. Wochenschr.*, 1896, No. 2.

595. SIEMERLING. On the alterations of pupillary reaction in the insane. *Berl. klin. Wochenschr.*, 1896, No. 44.

596. SPIRO. A case of congenital ectropium uveæ. *Centralbl. f. prakt. Augenheilk.*, xx., p. 3.

597. HIRSCHBERG-BIRNBACHER. Carcinoma of the posterior surface of the iris. *Ibid.*, p. 290.

598. WAERTER. Two cases of sarcoma of the iris. *Wjest. ophth.*, xiii., 4 and 5.

599. RUDIN. Cocainization of the iris. *Ibid.*, Nov.–Dec., 1896.

600. DANILOW. The tuberculous affections of the eye. A case of tuberculous irido-cyclitis. *Wojenno Med. Journ.*, May, 1896.

601. HARLAN, G. C. Rupture of the iris at the pupillary margin and in continuity from contusion of the eyeball. *Ophth. Review*, xv., p. 253.

602. LAWFORD. The formation of artificial pupil by extra-ocular iridotomy. *Ibid.*, p. 221.

603. ALT. A case of apparent non-traumatic double irido-dialysis; glaucoma; ciliary staphyloma; detachment of the retinal periphery; choroidal hemorrhages; disseminate chorio-

retinitis and neuritis optica. *Amer. Journ. of Ophth.*, Dec., 1896.

604. FISKE, E. R. Congenital aniridia. *Homœopathic Eye, Ear, and Throat Journal*, Nov., 1896.

It has previously been believed that the pupil reacts in hysterical attacks, and is irresponsive in epileptic attacks. KARPLUS (594) has now found reflex iridoplegia during the attack in a number of hysterical patients.

In an interesting contribution SIEMERLING (595) speaks of the great value of reflex iridoplegia in the diagnosis of progressive paralysis. In sixty-eight per cent. of his cases reaction to light was wanting or reduced, and it is frequently a very early symptom. The reflex iridoplegia is bilateral as a rule, and the pupil becomes elliptical or angular. A contraction of the pupil on exposure to light with a quick return to its previous width is observed in some forms of paralysis, as is also the paradoxical reaction—the reversal of the pupillary reflex. Hitherto great weight has been laid upon the difference in the size of the pupils, which was held to be an important symptom of paralysis, but to-day this is not much considered, since it is found in healthy individuals, in functional neuroses, and in general diseases. Jerking mydriasis is now and then observed in paralysis, while hippus is rare in paralysis, but more frequent in other brain diseases. From statistics of 9160 cases of various nervous diseases, the author shows the importance of the pupillary symptoms in paralysis. Dilatation of the pupil without light reaction is the chief differential symptom from hysterical attacks, in which the dilated pupil reacts. In general paralysis the pupillary reaction to sensory stimulation is lost first, reaction to light following, while in tabes this is reversed, according to Bewan. A very marked reaction occurs in epileptics after the attack, and in cases of extensive circulatory disturbances and morphinism. Many experiments have been made in regard to the location of the affection producing this symptom. It has not been possible to find a particular group of nuclei in or near the oculo-motor nucleus which could be made answerable for the pupillary reflex. But it is known that the centripetal pupillary fibres semidecussate in the chiasm, this being proved by the condition of consensual reaction in incomplete reflex iridoplegia. In each tract indeed are fibres from both eyes; one tract suffices both to receive the excitation to contraction of the iris from the two eyes, and also to conduct the excita-

tion to both oculo-motor nerves. There must be therefore a partial crossing of the pupillary fibres peripheral to the tract, in the chiasm, and also one central to the chiasm.

In a man of twenty-six, whose case is reported by HIRSCHBERG and BIRNBACHER (597), a tumor appeared on the posterior surface of the iris near the upper pupillary margin, which was partly covered by the pigment layer. An iridectomy was made, and as the pain became severe, enucleation was finally performed. Behind the iris, displacing the lens, was a tumor 10 *mm* by 5 *mm*. Microscopically this consisted chiefly of epithelial cells arranged in tracts and cylinders without intervening substance. The cells were derived from the proliferating cells of the pigment layer. On the ground of its histological structure the tumor was regarded as a carcinoma.

WAERTER (598) continues the scheme of summarizing all the cases of sarcoma of the iris utilized by Fuch in 1882. Since then twenty-three cases have been described, and before 1882, seventy-six. The author's two new cases are as follows: 1. In a woman of seventy-two, a small, pigmented tumor appeared in the inner-lower portion of the chamber angle of a blind eye. The tumor, which was composed of pigmented spindle cells, had destroyed the tissue of the iris up to the pupillary margin, leaving the sphincter intact. It also extended into the ciliary body, infiltrating the ligamentum pectinatum. 2. In a woman of sixty, a small brown tumor appeared in the inner-lower portion of the iris. $V = \frac{2}{3}$. Examination showed this tumor to be in all respects similar to the first. The greatest number of cases were between the ages of forty and sixty, and women were more frequently attacked than men. Even the tumors which are apparently small, have usually extended deep, and, notwithstanding good vision, enucleation is preferable to iridectomy.

HIRSCHMANN.

In order to make the iris less sensitive during operation, RUDIN (599) injects a small quantity of cocaine in bichloride solution beneath the conjunctiva at the upper margin of the cornea. The vesicle there produced is pushed round the cornea with a pledget of cotton. In eleven operations the result was satisfactory in eight, and partially so in two. In one prolonged operation the patient complained of pain. (Koller's method.—ED.)

HIRSCHMANN.

DANILOW (600) gives a résumé of the literature of ocular tuber-

culosis—59 cases of affection of the conjunctiva, 5 of the cornea, 31 of the iris, 7 of the ciliary body, 29 of the uveal tract, 6 of the retina and optic nerve, and 5 in the lachrymal gland.

In his own case of tuberculosis of the iris, the patient soon died of pulmonary tuberculosis. Microscopically he found an infiltration (with polynuclear cells) in the cornea, iris, ciliary body, and adjacent portions of the sclera, and also in the lens, with destruction of its anterior çapsule. Bacilli were found in small numbers.

HIRSCHMANN.

HARLAN (601) records six cases of rupture of the iris at the pupillary edge or in continuity. In three of the cases there was no hyphæma or iritis, and vision was not much lowered. The condition remained permanent, the pupil differing in this respect, according to Harlan, from true traumatic paralysis of the iris, in which recovery generally takes place. WERNER.

LAWFORD (602) practises, with good results, Schoeler's method of extra-ocular iridotomy, in which the iris is carefully withdrawn, as in doing iridectomy, but merely incised, and then replaced in the anterior chamber. It produces an ideal pupil for visual purposes. WERNER.

In this interesting case of ALT (603) there was, in his opinion, some procsss in the anterior portion of the eyeball which led to a cicatricial contraction, which drew the periphery of the iris down to the iris angle, beginning downward and outward, and afterwards affecting the remainder of the iris periphery. The curious feature, however, is that the centre of the iris remained as a band passing across the anterior chamber from above downward, the contraction at the periphery seeming to have torn the iris in two. During the shrinkage the iris had become torn away from the uveal layer. The paper is illustrated with four micro-photographs.

BURNETT.

FISKE (604) gives an account of a father and three children affected with congenital deficiency of the iris of both eyes. In one a coloboma with the base inwards in both eyes, one with a slight remnant of the iris to the outer side of both eyes, and in the third practically complete absence of iris tissue. Two other children have normal eyes. No history of consanguinity.

BURNETT.

XIII.—CHOROID.

605. VAN DUYSE. Choroidal sarcoma of the macular region with propagation into the orbit. *Arch. d'opht.*, xvi., No. 11.

606. LAQUEUR. Is there an essential phthisis bulbi? *Report of the meeting of German naturalists and physicians at Frankfort-on-the-Main*, 1896.

607. GRANDCLÉMENT. A new contribution to iridic uveitis.

608. DOR. Contribution to the study of spontaneous detachment of the retina. *Arch. d'opht.*, xvi., No. 12, p. 735.

In VAN DUYSE'S (605) case there was a sarcoma of the macular region, non-recognizable because of a senile cataract, which extended into the orbit along the optic nerve and the posterior ciliary arteries, and revealing its presence three years later by producing a rapidly increasing exophthalmus. The tumor was an alveolar sarcoma arising from the endothelial cells of the intervascular spaces in the layer of larger vessels. Only a small portion of the intraocular portion was pigmented.

v. MITTELSTÄDT.

LAQUEUR (606) reported a case of hypotony in a healthy eye. After a slight injury of the corneal epithelium hypotony was repeatedly observed, always coming on with simultaneous irritation of the eye. Later the parenchyma of the lower ⅔ of the cornea became opaque. The attacks then came on at intervals, first in one eye and then in the other. The affection was thought to be due to neurosis of the sympathetic, since other signs existed of disturbance of the sympathetic.

GRANDCLÉMENT (607) designates as "iritis uvéenne" an inflammation of the iris limited to the pigment layer, which comes on particularly in women of middle age, the attacks not being accompanied with much subjective disturbance or symptoms of irritation, and recurring at intervals, the sight gradually diminishing through a period of years. The usual causes of iritis are not present, and no treatment except iridectomy is of benefit. Three cases are reported. Apparently these are cases of what is usually called idiopathic chronic irido-choroiditis. v. MITTELSTÄDT.

DOR'S (608) patient, a woman aged seventy-seven, suffered from pain in and about the left eye with increase in tension. The ophthalmoscopic picture was that of a sarcoma of the ciliary region, but when the hardened eyeball was examined no sarcoma could be found. The choroid, however, to which the retina was everywhere adherent, was detached from the sclera in several places by a greenish hyaline exudation. The choroid was œdematous, the vessel-walls thickened but with normal endothelium. About the vessels were small hemorrhages and miliary abscesses

free from micro-organisms. The abscess formation, according to Dor, was the primary change, the process being an infectious choroiditis, and the hemorrhages secondary. A sero-albuminous exudation caused œdema of the choroid and detachment. This seems to be the only case of spontaneous detachment of the choroid which has been examined both clinically and anatomically. V. MITTELSTÄDT.

XIV.—GLAUCOMA.

609. DE WECKER. False glaucoma. *Ann. d'ocul.*, cxiii., p. 239.

610. ELSCHNIG. Anatomical examination of two cases of acute glaucoma. *Arch. f. Augenheilk.*, xxxiii., supplementary volume, p. 183.

611. EPINATJEW, S. An unusual case of congenital anomaly of the eyes. *Wjest. ophth.*, 1896, No. 6.

612. WARLOMONT. Two cases of bilateral buphthalmia, with preservation of good vision, observed in two brothers. *Ann. de la société scientifique de Bruxelles*, xxx., part 2.

613. BOCCHI. The incision of the tissues of the iris angle according to De Vincentiis in hydrophthalmus. *Arch. di Ottalm.*, iv., 3–4, p. 130.

614. BIETTI. Ophthalmometric observations on eyes operated on for glaucoma, with special reference to the incision of the tissues of the iris angle (De Vincentiis). *Ann. di Ottalm.*, xxv., 4, p. 319.

False glaucoma, concludes DE WECKER (609) in his paper on the subject, is often confounded with true glaucoma. When the ophthalmoscope alone is depended upon to make the diagnosis, one-half the cases of simple glaucoma are false glaucoma. This false glaucoma is a primary disease of the nerve-head, requiring medicamentous treatment, while true glaucoma, even when of the chronic simple variety, demands sclerotomy. SULZER.

ELSCHNIG (610), refraining from theorizing, simply describes the appearance of two eyes with glaucoma which were examined shortly before death, but not operated upon. The corneal epithelium exhibited degenerative changes, the corneal parenchyma was unaltered, and the endothelium was irregular and exhibited marked changes in the form of the cells. The lens exceeded in all its dimensions the average dimensions of the normal lens. In

the ciliary body the circular muscle of Müller was pushed forward, and the ciliary processes pointed toward the iris. The ciliary portion of the iris had acquired an attachment to the ligamentum pectinatum, at some points loose, at others with a close union of the tissues. The iris was not materially affected. The ligamentum pectinatum and the adherent portion of the iris were free from signs of inflammation. The canal of Schlemm was displaced only to a slight extent. The ciliary body and processes exhibited signs of degeneration: in many bundles single muscle cells were transformed into a granular detritus, in other places the entire bundles were thinned. In the ciliary processes the wide lumen of the capillaries and the rarefaction and proliferation of the palisade epithelium were noticeable. The venæ vorticosæ exhibited endo- and peri-vascular changes here and there. The vessels of the choroid were often dilated, and their walls thickened. The optic nerve in transverse section was normal everywhere. The nerve fibres exhibit varicose hypertrophies. In the retro-laminar portion of the optic nerve the nerve-fibre bundles were somewhat thinned, and pervaded with round cells. Many round and oval spaces appeared among the degenerated nerve fibres. The intervaginal space was narrow and cleft-shaped at its bulbar termination, while farther back it was wider.

Epinatjew (611) describes a case of bilateral hydrophthalmus with cornea globosa, anisocoria, oval pupils, and irido-donesis, with emmetropia and V = $\frac{20}{20}$.

Warlomont (612) describes two unusual cases of buphthalmus observed in two brothers. A., æt. thirteen, bilateral buphthalmus, horizontal diameter of cornea 17 *mm*, deep anterior chamber, and tremulous iris. Normal curvature of cornea. The right eye is emmetropic with V = $\frac{2}{3}$; the left obtains normal vision with a — 1.D cylinder oblique.

B., æt. sixteen. Buphthalmus less advanced and unequal in the two eyes. Horizontal diameter of the cornea L 13 *mm*, R 13.5 *mm*. Compound myopic astigmatism of 4. or 5. D. R V=$\frac{1}{2}$, L V = $\frac{1}{3}$. The retina and optic nerve were normal in both cases.

Sulzer.

Bocchi (613) had the opportunity of examining an eye which had been enucleated for infantile glaucoma when three iridectomies and section of the iris angle had not sufficed to relieve the pain. The author states that the filtration spaces were found least altered at the spot where the insertion of the iris was cut

through, indicating the superiority of this new operation. Furthermore, the period of freedom from pain lasted longer after the incision of the iris angle than after the three iridectomies.

DANTONE.

BIETTI (614) examined forty-three glaucoma patients with the ophthalmometer, both before and after the operation, in order to determine the effect of increased tension upon the curvature of the cornea, and consequently upon the refraction of the eye. In two-thirds of the cases such changes were found to have occurred in some or all meridians. The eyes were subjected to repeated paracentesis, iridectomy, or incision of the iris angle. In conclusion, Bietti records the favorable results obtained in twenty-three cases by incision of the iris angle. DANTONE.

XV.—SYMPATHETIC OPHTHALMIA.

615. MEYER. A case of sympathetic ophthalmia after subconjunctival rupture of the ball. *Inaug. dissert.*, Jena, 1896.

616. ANGELUCCI. Researches on sympathetic ophthalmia. *Arch. di Ottalm.*, iv., 1–3, and 3–4.

ANGELUCCI (616) examined bacteriologically twelve eyes enucleated after having caused sympathetic ophthalmia, and also portions of the iris removed by iridectomy from the eyes sympathetically inflamed. From the detailed reported results of his inoculations, it is particularly worthy of note that the cocci and diplococci from the iris of the two eyes sympathetically inflamed caused similar inflammatory changes when inoculated into the eyes of rabbits. DANTONE.

XVI.—LENS.

617. ELSCHNIG. On discission. *Wiener klin. Wochenschr.*, 1896, No. 53.

618. DA GAMA PINTO. A contribution to the operation for secondary cataract. *Zehender's klin. Monatsbl.*, xxxiv., p. 294.

619. GALEZOWSKI. On the operation of adherent secondary cataract by incision from behind forward. *Rec. d'opht.*, 1896, p. 587.

620. BERRY–CROSS. A discussion on cataract extraction. Ophth. Section, Brit. Med. Assoc., 1896. *Brit. Med. Jour.*, Sept., 1896, p. 822.

621. WARE, LYMAN. Report of one hundred cases of extraction of hard cataract. *Jour. Am. Med. Assoc.*, Oct. 24, 1896.

622. HARLAN, HERBERT. A contribution to the question of removal of the lens in myopia. *Ibid.*, Nov. 28, 1896.

ELSCHNIG (617) begins with historical remarks on discission. He has now abandoned the discission needle, which produces a wound that is readily infected, and which is not adapted for cutting through the mass. He employs the method of Schnabel. A Graefe knife is introduced as in extraction, the capsule is perforated low down and then divided by depressing the handle of the knife. In secondary cataract the knife is passed through the cornea at another point. (Schweigger now divides all secondary cataracts with scissors which are introduced through a small wound made with a lance.—REV.). Discission is never used for ripening senile cataract. All senile cataracts in persons over fifty are readily removable, whatever the condition of nucleus and cortex. Elschnig does extraction as soon as vision becomes too poor to permit the patient to follow his ordinary vocation.

DA GAMA PINTO (618) did the operation for secondary cataract 326 times after 528 extractions. He used Knapp's knife, Schweigger's broad needles, De Wecker's scissors, and particularly the Graefe knife. Schweigger has now discarded the needles, since the open space obtained is apt to close when the needles are withdrawn. In 133 eyes he did the so-called posterior discission, in which the Graefe knife is passed through the sclera 6 to 8 *mm* behind the sclero-corneal junction.

BERRY (620) has come round to the view that simple extraction, if performed according to Prof. Snellen's method, possesses more important advantages than the cosmetic one. But there are certain cases unsuitable, and if he were to select one operation for all cases, he would still adopt the combined method. In doing Snellen's operation Berry uses a speculum ; at first he experienced a difficulty in preventing the iris falling in front of the knife. Prolapses are very rare in the operation, and when this occurs, it is within an hour or two. Berry performs iridectomy if the iris does not go back so as to form a round pupil. This is necessary in about 10 per cent. of the cases. Iritis is much less frequent than after combined extraction. The visual acuity does not seem better than in the latter. Hard, nuclear cataracts in old people, over-ripe cataracts with capsular opacities, or cases with iritic adhesions or shallow anterior chamber, are reserved for combined extraction.

CROSS agreed with Berry's views; he considers it important not to subject the eye to unnecessary toilette.

LANDOLT also approved of Snellen's operation. WERNER.

The method ordinarily used by WARE (621) is to make a small preliminary iridectomy. The section for the extraction of the lens is always large, generally one-half the circumference of the cornea. Capsulotomy by Knapp's method. Four per cent. of losses. The majority had vision $\frac{1}{10}$–$\frac{1}{2}$, and two cases $\frac{1}{4}$.

BURNETT.

The two cases which HARLAN (622) contributes to the question of lens removal in myopia were both accidental. In one the lens was dislocated into the anterior chamber in a man of thirty-two. He had been wearing — 13. After the extraction of the lens, with + 3.5 ⊃ + 4.5 165° V = $\frac{15}{40}$. In the second case, a woman of forty-five years had vision of $\frac{20}{50}$ without glasses in an eye from which the lens had been extracted at thirteen years; a + 2 slightly improved it; with + 5 she read "brilliant" type at twelve inches. BURNETT.

XVII.—VITREOUS.

623. POLLOCK. A case of peculiar punctate opacity of the vitreous. *Beiträge z. Augenheilk.*, xxiv., p. 83.

624. BICKERTON, T. H. The advantages of Mules's operation of evisceration with insertion of artificial vitreous over enucleation of the eyeball. *Brit. Med. Journ.*, Sept., 1896, p. 813.

625. CLAIBORNE, J. H. Some experiments on rabbits made with a view to obtaining a stump for the accurate fitting of glass eyes. *Journ. Amer. Med. Assoc.*, Nov. 21, 1896.

BICKERTON (624) deals in an extensive paper with this subject. He considers the operation most satisfactory, having performed it forty times, but only twenty-four are carefully recorded. In five cases only was the glass globe extruded. Probably the best thing to do in these cases is to pare the edges of the wound and put in a smaller ball. Chromised gut is used for sutures. To control the reaction, no bandage is applied, but iced perchloride of mercury solution, sometimes with lead and opium.

Mr. Juler attributes the escape of the glass globe to its being too large.

[Here in Dublin the operation is constantly performed with very good results. Silk sutures are used, and left in permanently without causing any irritation. Escape of the globe seems to be due either to too large a globe being used, or to imperfect adaptation of the edges of the scleral wound.—L. W.] WERNER.

In 1889, CLAIBORNE (625) made experiments with sponge and cotton as a filling for the cavity of the eye after evisceration, but they were not satisfactory. Later he experimented with glass, wool, and asbestos as a filling, but found that they were not tolerated by rabbits any better than the sponge or cotton. On the whole he deems the ordinary enucleation the safest and best method yet devised of dealing with eyes that require removal.

BURNETT.

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

626. FUCHS. On erythropsia. *Graefe's Archiv*, xlii., 4, p. 206.

627. BIONDI. The pathological changes in the retina in pernicious anæmia. *Arch. f. Augenheilk.*, xxxiii., supplementary number, p. 83.

628. HIPPEL, E. On degeneration of the retina from iron splinters, with remarks on magnet extraction. *Graefe's Archiv*, xlii., 4, p. 152.

628 A. BERGER. Amblyopia and amaurosis of the circumpapillary zone of the retina. *Arch. d'opht.*, xvi., p. 672.

629. HIRSCH. On the pathology of embolism of the retinal arteries. *Arch. f. Augenheilk.*, xxxiii., supplementary number, p. 139.

630. AXENFELD. On thrombosis of the retinal and choroidal veins in general sepsis. *Aerzt. Verein* zu Marburg, 1896.

631. SIMON. Affections of the retinal veins as the cause of hemorrhage into the retina and vitreous in young persons. *Centralbl. f. prakt. Augenheilk.*, xx., p. 325.

632. PURTSCHER. On spontaneous connective-tissue formation in the retina and vitreous (retinitis proliferans), with a consideration of the etiology of hemorrhagic glaucoma. *Arch. f. Augenheilk.*, xxxiii., supplementary number, p. 1.

633. NUEL. On the pathology of detachment of the retina *Arch. d'opht.*, xvi., No. 10.

634. SIMI. A case of detachment of the retina through metastasis. *Boll. d'ocul.*, xviii., 77.

635. GOSETTI. Detachment of the retina and its treatment by injecting rabbit's vitreous into the vitreous chamber. A clinical conference. Venice, 1896.

636. USSHER. Observations on the retinal blood stream at the time of death. *Ophth. Rev.*, xv., p. 339.

637. WRAY. The treatment of detached retina. *Trans. Ophth. Soc. U. K.*, xvi., p. 63.

638. COLLINS, E. TREACHER. On the origin of ruptures in detached retina. *Ibid.*

639. EVE, F. Detachment of the retina treated by drainage. *Ibid.*, p. 76.

640. SNELL. On the employment of electrolysis in the treatment of detached retina. *Ibid.*, p. 72.

641. JULER. Six cases illustrative of interesting changes in the retina. *Brit. Med. Journ.*, Sept. 26, 1896.

642. MONTGOMERY, W. T. Electrolysis in the treatment of detached retina. *Journ. Amer. Med. Assoc.*, Sept. 26, 1896.

643. RANDOLPH. The anatomic changes in two cases of retinal detachment. *Ibid.*, Oct. 3, 1896.

644. REIK. Etiologic factors other than myopia in the production of retinal detachment. *Ibid.*

645. WOOD, CASEY A. Treatment of detachment of the retina. *Ibid.*

646. MILLIKEN, B. L. Three cases of detachment of the retina in the same family. *Annals of Ophth. and Otol.*, Oct., 1896.

647. BELT. A case of alcohol-tobacco amblyopia with retinal hemorrhage associated with peripheral multiple neuritis. *Ibid.*

In a comprehensive and highly interesting paper FUCHS (626) gives first a historical sketch of the literature of erythropsia, and states that the most various conditions have been described under this name, among them such as religious frenzy and the aura of epilepsy. He then takes up the cases in which the pupils are dilated or the lens absent, the erythropsia here being due to external causes, such as dazzling and the like. In normal eyes the glare from the snow brings about an erythropsia best observed on entering a dimly lighted room. Erythropsia appears either when an unusual amount of light reaches the retina or when the retina reacts abnormally to light, as in conditions of excitement. General disturbances, pregnancy, etc., also dispose to erythropsia. The actual hue of objects is recognized through the red shimmer, except in the case of green, which is blotted out or only appears gray. The subjective color is really a purple, and is mostly seen

with one eye, but sometimes with two. Views differ as to the seat of the lesion. Fuchs regards it as peripheral. In the experimental part of the paper he shows that erythropsia is a physiological phenomenon which probably can be called forth in every eye. The pathological cases are distinguished by the fact of the phenomenon being more intense and of longer duration. A normal eye, dazzled by light from the snow, at first sees green in a dimly lighted room and after fifteen seconds red. The periphery is more affected than the centre. Experiments in which different colored glasses were held before the eye showed that the color tone of the erythropsia is independent of the color of the light producing it. Red glass hindered less than any other the development of erythropsia. Experiments were made on abnormal eyes also : (a) in aphakic eyes, walking unprotected in bright light brought about erythropsia not preceded by the sensation of green ; (b) in eyes having a lens but being color-blind, red was seen ; (c) most aphakic eyes were found to have a low degree of erythropsia when the color sense was tested. Experiments in regard to the light sense of aphakic eyes were made. Since the lens absorbs chiefly the ultra-violet rays, the light impinging upon the retina is poor in such rays. In aphakic eyes the ultra-violet rays reach the retina and produce subjective color-sensations and a sense of dazzling. Daylight is red, the snow has a violet color, and daylight reflected from the snow is therefore richer in the short-waved violet rays. The sensation of green coming on before the erythropsia may be regarded as the complementary after-image of the light reflected from the snow, and the erythropsia as the after-image of the same color. Since these phenomena appear only after the continued action of a dazzling light, Fuchs would distinguish them from the ordinary after-images. These images after dazzling can be explained through changes in the visual substance or through the becoming visible of the visual purple. Which of these two explanations is the correct one, cannot yet be said.

Biondi (627) comes to the following conclusions. The retinal hemorrhages which are always present in pernicious anæmia may involve several layers or even the entire thickness of the retina. The nerve-fibre and the outer reticular layers are those more frequently affected. The hemorrhages vary in size from pin-point up to those broader than the disc. The light points in the centre of the hemorrhages are due partly to varicose or ganglionic de-

generation of the nerve fibres, partly to globular hyaline masses. The nerve fibres always exhibit varicose hypertrophies and ganglionic degeneration. The walls of the smaller vessels are diseased. The diagnosis "retinal hemorrhages" seems more fitting than "retinitis hemorrhagica."

HIPPEL (628) examined anatomically an eye destroyed through injury with a splinter of iron. The diagnosis was: total atrophy of the muscular structure of the iris and partial of the ciliary body, sclerosis and retraction of the ciliary processes, total absorption of the lens, marked shrinking of the vitreous, slight chronic choroiditis, total degeneration of the undetached retina, with consecutive atrophy of the optic nerve; siderosis of the iris, pigment epithelium, pars ciliaris retinæ and retina, delicate new membranes about the foreign body. The degeneration of the retina from the chemical action of the iron was the cause of the total blindness. A number of cases are cited in which an iron splinter in the eye was well borne and caused no detachment of the retina, and a number also in which later a fresh inflammation came on and the retina became detached. No reason is known why the degeneration of the retina should come on in some cases and be absent in others.

BERGER (628A) recommends that, in taking the visual field, the blind spot and the neighboring region be examined. Since the circumpapillary fibres here involved run just beneath the pial sheath, a perineuritis reveals itself, above all, by the enlargement of the blind spot, or the existence about the latter of an amblyopic zone. The author shows, by a number of cases of sympathetic neuritis, retrobulbar neuritis, and tabic atrophy, the importance of such examination. In the last-named disease, enlargement of the blind spot, and circumpapillary amblyopia, render the prognosis bad, and indicate a rapid course. In intoxication amblyopias, this defect in the field was also found passing over into the central scotoma. In optic-nerve atrophy due to arterio-sclerosis, it was seen in cases in which it could not be referred to changes in the retina. Enlargement of the blind spot, varying at different examinations, was found in neurasthenics, and may possibly, by the difficulty in orientation which it causes, explain agoraphobia. V. MITTELSTÄDT.

HIRSCH (629) reports a case of embolism of a branch that had the ophthalmoscopic picture of a cilio-retinal artery, but there are others in which no vessel of that appearance is found, and

therefore he believes that this region of the retina is supplied by a particular branch of the central artery of the retina (as do most recent writers on the subject). He supposes the blood supply of the retina to be distributed to three distinct regions: one supplied by the upper branch of the central artery, a second supplied by the lower branch of the central artery, and a third, a papillo-macular triangular region, supplied by the smaller branches of the central artery. The macula, he believes, is supplied by all three, and hence central vision is abolished only when all three branches are involved, or the central artery is obstructed low down.

AXENFELD (630) speaks of the establishment of collateral circulation after thrombosis of the central vein, through the medium of the already existing capillary connections. In consequence of this, the disturbances of vision are not such as are indicated by the ophthalmoscopic picture. In cases of unilateral independent thrombosis, one usually finds arterio-sclerosis and cardiac lesions, so that Michel regards the process as marantic. Still, there must be a special disposition of the central vein in the region of the lamina cribrosa, since venous thromboses have not been seen elsewhere at the same time. That true marantic thrombosis may occur is shown by the following case: A man with hemorrhagic sepsis, with extensive hemorrhages in the retina without signs of stasis, showed quite fresh mural thrombosis in the right central vein, two capillaries of the right eye had hyaline thrombi, and several choroidal veins had fresh thrombi, a state not previously described.

SIMON'S (631) patient, an otherwise healthy man of twenty-one, who suffered from recurrent hemorrhage into the vitreous, had normal retinal arteries, but marked venous changes. The veins exhibited white sheaths (perivasculitis), and were from time to time concealed by small round or elongated grayish exudations. The latter soon disappeared, and were mostly the forerunners of retinal hemorrhage.

PURTSCHER'S (632) conclusions as to retinitis proliferans are as follows: There is a formation of connective tissue in the retina and vitreous referred to hemorrhage, traumatic or spontaneous, the latter variety due to a pathological condition of the circulatory apparatus, or of the retinal vessels themselves. In this condition we have to consider, on the one hand, direct products of the transformation of hemorrhages, and, on the other, the products of

a retinal inflammation due to reaction. In the second place, there is a connective-tissue proliferation in the retina as a result of a peculiar vascular disease, as the product of a retinitis in the sense of Manz, who first described the condition. Hemorrhages accompany this latter affection, but only incidentally, and to it alone belongs the name retinitis proliferans. Secondary glaucoma may arise in the affected eye as a result of the vascular disease.

Ussher (636) describes in an interesting paper the changes observed just before and after death, in six patients and also in monkeys, cats, and rabbits. In the human beings, just at the last gasp, the blood was seen to become at first finely and then coarsely granular, and the blood was observed to flow towards the optic disc even in the arteries. Later on, the beaded appearance due to breaking up of the blood column, and which has been described by previous observers, took place. Cats are more suitable for examination than the other animals, as the media in them remain clearer. The granular appearance and visible movement occur before the heart ceases to beat, and life may still be restored during this phase.

In order to determine the influence of the intra-ocular tension, the anterior chamber was tapped, but it was found necessary to remove the cornea to obtain a clear view. When this was done, the blood became granular, but no visible movement or beading occurred, and the vessels did not empty themselves. Increasing the tension by injecting a saline solution into the vitreous caused visible movements in both arteries and veins. In human beings after death Ussher has never seen the arteries empty themselves in the direction of their current, but always in the opposite direction. The granular appearance is due to the slowness of the current allowing blood corpuscles and collections of blood corpuscles to become visible. WERNER.

Wray (637) first describes the different methods of treatment which have been adopted. He performed scleral puncture frequently and never saw the least reaction. One case was exhibited in which the operation had effected complete reapposition of the retina. Vision improved from counting fingers at 3 metres to $\frac{6}{6}$, and remained so when seen seven months later.

Dr. Little had seen two complete recoveries after the operation. A successful case of Mr. Tweedy's was also alluded to. Mr. Wray in reply stated that he had elicited the fact that the operation was safe. WERNER.

COLLINS (638) describes the views of Von Graefe, De Wecker, Nordenson, Raehlmann, as to the causes of retinal detachment and ruptures, and reports two cases in which microscopic examination supported Elschnig's theory as to the cause of ruptures in retinal detachments. In each case a small portion of retina remained attached in the yellow-spot region to which it was adherent, having been torn off the detached portion, owing to choroiditic adhesions. Whenever an eye is cut open, the edges of the retina turn in, hence the fact that the edges turn in in ruptures is of no importance as evidence for or against any particular theory. WERNER.

EVE'S (639) patient had a large detachment of the retina in the left eye R E V = $\frac{6}{6}$ with − 1. D. The detachment was treated by scleral puncture and insertion of a bundle of horse-hair. V improved from p. l. to $\frac{6}{24}$. Two months later field normal, no detachment. V = $\frac{6}{36}$. WERNER.

SNELL (640) had, on the whole, found puncture of the sclerotic the most satisfactory method of dealing with detached retina. He records three cases treated by electrolysis according to Terson's method, using a platino-iridium needle at the positive pole with a current of 5 milliampères. The first case was one of old and extensive detachment and no result was obtained. In the second the detachment was diminished and V rose from fingers to $\frac{6}{24}$ and remained so four months later. In the third case the retina became replaced but V only rose to $\frac{1.6}{100}$ with + 4. WERNER.

JULER (641) showed six microscopic specimens. Case I. *Retinal Apoplexy.*—The whole thickness of the retina was infiltrated with blood, but none escaped into the vitreous. No inflammation. Patient aet. thirty-nine, with valvular disease and acute nephritis. Acute glaucoma supervened. Case II. *Glioma Endophyton.*—A girl æt. six years. Yellowish mass seen by oblique illumination behind lens. Ant. ch. shallow. Tn. Left eye normal; no recurrence nine months after enucleation. The glioma infiltrated the whole retina up to but not beyond the ora serrata. Nerve layer most involved. Iridic angle free. Case III. *Glioma Exophyton.* Boy aged two and a half years. Brilliant yellow reflex behind lens. T+. Iridic angle was seen in specimen to be closed. Retina detached, outer surface nodular especially towards the nerve. Case IV. *Choroido-Retinal Atrophy.* Case V. *Peculiar Retinal Growth Simulating Glioma.* The growth was intraretinal and fibrous, probably the result of hemorrhage. An

orbital tumor supposed to be a secondary growth turned out to be a dermoid cyst. Case VI. *Ciliary Staphyloma*, choroido-retinal atrophy, deep cup. WERNER.

From an experience of four cases of detachment of the retina treated by electrolysis, MONTGOMERY (642) concludes that the treatment is exceedingly painful, but not immediately followed by severe reaction; that it is valueless as a corrective agent in the treatment of detachment; and that it may be a factor in exciting inflammatory glaucoma. BURNETT.

RANDOLPH (643) gives the histories of two cases of detachment of the retina which he had examined histologically. There was widespread degeneration of the retinal layers, and especially the layer of rods and cones. The granular layers were usually preserved, and there was swelling of Müller's fibres. But the most striking anatomic change was the fibrillary degeneration of the vitreous body, and which he considers the chief element in the pathogenesis of the disease. There are two figures representing these conditions in the paper, as published in the *Johns Hopkins Hospital Bull.*, for Sept.–Oct., 1896. BURNETT.

After a consideration of the various theories advanced for the cause of retinal detachment, aside from high degrees of myopia, and the facts on which they are based, REIK (644) thinks that it is probably safe to say that the vitreous is always the seat of pathologic alterations, though such changes may not be and often are not apparent by ophthalmoscopic examination. BURNETT.

After a review of the whole subject and the various plans that have been proposed for the treatment of retinal detachment, WOOD (645) concludes that we have discovered no better system than that followed by the older ophthalmologists, viz: rest in bed, bandages, atropine, and the internal use of some absorbent. He advises to substitute soda bicarbonate and potass iodid for pilocarpine when the latter disagrees. Puncture in recent cases may do a temporary good. BURNETT.

MILLIKEN (646) gives the histories of three cases of detachment of the retina, in three brothers, coming on after middle life; all in the right eye,—the left being unaffected,—all being in tolerably fair health and with no family history of serious disease; the detachments all being in the same part of the backgrounds the upper-outer portion. In only one was there any myopia, 4.5. Treatment was of no avail in arresting the spread of the detachment. BURNETT.

BELT's (647) patient was a man of thirty-five years, a heavy drinker, who smoked about 15 cigars a day. Was hardly able to walk on account of multiple neuritis. Has some astigmatism, but vision not much impaired. Some two months later, when called to see him, after an attack of delirium tremens, V was reduced to $\frac{1}{100}$ in each eye, and an extensive retinal hemorrhage in the right eye, locality not stated. Retinal veins full. Alcohol and tobacco stopped, increasing doses of strychnia were given, and in a month vision was restored to the normal. BURNETT.

XIX.—OPTIC NERVE.

648. PARINAUD. Retrobulbar neuritis and the paths of infection of the nervous system. *Jour. de med. et de chir.*, July, 1896.

649. DEAN, GEORGE, and USSHER, C. H. Experimental research on the course of the optic fibres. (Preliminary communication.)

650. ELLIS, H. B. A case of total blindness possibly due to an overdose of quinine. *Journ. Amer. Med. Assoc.*, Nov. 7, 1896.

651. DE SCHWEINITZ. Optic-nerve atrophy from toxic agents. *Ibid.*, Oct. 31, 1896.

652. SHORT, O. S. Treatment of optic atrophy by mercurial inunctions in conjunction with the hot baths of Hot Springs, Arkansas. *Ibid.*, Dec. 5, 1896.

PARINAUD (648) by retrobulbar neuritis understands a peripheric neuritis of the optic nerve as distinguished from an optic neuritis of cerebral origin. The affection in intoxication amblyopias is a systemic, symmetrical degeneration probably dependent upon a disturbance of the visual centre and not to be confused with retrobulbar neuritis proper. These are called, respectively, toxic and infectious retrobulbar neuritis. The infectious form may be acute or chronic, and the path of infection is through the nose and ethmoid or through the orbit. SULZER.

The authors (649) conducted experiments on rabbits and monkeys, in order to determine the relation of the parts of the retina to those of the optic nerve. The method of operating consisted in dividing the retina with a Graefe's knife passed through the sclerotic just behind the ciliary region, taking antiseptic precautions. The animal was killed about four weeks after the operation. The parts were carefully hardened with Müller's fluid and

tained by Marchi's osmium-bichromate method. The eyeballs were divided equatorially and mounted in glycerine jelly, showing the lesions in the retina. The lesions were produced in the neighborhood of the disc. In rabbits a limited degeneration occurred in the optic nerve throughout its whole course, and occupied always the same position in relation to the nerve section in any one nerve, the position of the degeneration being similar in position to the retinal lesion. Incisions across the opaque fibres caused the densest degeneration. Some black points were found in the nerves of the opposite side, which may have been due to fatty matter conducted by the lymphatics to the opposite side, but it may be slight degeneration, as Kellerman found, in a case of optic atrophy, degeneration in the opposite nerve, which he attributed to compression of the nerve fibres in the chiasma, by the shrinking of the fibres, etc., belonging to the atrophic side.

The experiment on a monkey, the lesion being between the papilla and macula, proved more interesting, as the result corresponded exactly with lesions observed in toxic amblyopia. After the authors had written their paper, they discovered that PICK (*Deutsche Akademie der Naturforschr. Bd.*, lxvi., No. 1, 1895) had performed a number of similar experiments on rabbits with the same results as theirs. WERNER.

In ELLIS's (650) case the patient, a man of thirty-four, was an opium and whiskey habitué of quite long standing, taking twenty grains of morphia and from a pint to a quart of whiskey a day. After taking 120 grains of quinine in twenty-four hours in four doses, his vision, which had hitherto been good, failed totally. Vision gradually returned in two weeks, and again, without any ingestion of quinine, failed to simple p. l. Pupils very small, but fundus shows no change beyond some anæmia. BURNETT.

This communication of DE SCHWEINITZ (651) is a general consideration and a review of the literature of toxic amblyopias which he treats under the following heads: 1. Toxic atrophy of the papillo-macular bundle of the optic nerve preceded by inflammation or degenerative changes in this tract and associated with scotoma. 2. Progressive and scotomatous atrophy of the optic nerve, the result of toxic agents. 3. General atrophy of the optic nerve, the result of toxic agents. 4. Atrophy of the optic nerve secondary to retinal and other lesions, in their turn the result of toxic agents. BURNETT.

The conclusions arrived at by SHORT (652) from an experience

afforded by forty-one cases are, that those cases of atrophy of the optic nerve where there is only light perception remaining are not benefited by any treatment. If there is still V = $\frac{1}{200}$, we may expect benefit from mercurial inunctions and the hot bath. Unless there is a specific history of mineral poisoning, the iodid of potass. is harmful. Strychnia is good only in cases of spinal origin.

BURNETT.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

653. VAN DUYSE. Endo- (peri-) thelioma, or alveolar perithelial sarcoma of the orbit. *Arch. d'opht.*, xvi., 10, p. 604.

654. CERVERA, TORRES. A foreign body in the eye. *Ann. d'ocul.*, cxvi., p. 279 (an unusually large splinter of iron).

655. POST, M. H. Removal of a spiculum of glass from the vitreous with preservation of normal vision. *Ophth. Rev.*, xv., p. 311.

656. ALT. A case of rupture of the ligamentum pectinatum, (cyclo-dialysis), irido-dialysis, and dislocation of the lens due to contusion. *Am. Jour. of Ophth.*, Oct., 1896.

657. HANSELL. Extraction of a piece of steel from the vitreous by the Hirschberg magnet. *Ibid.*, Dec., 1896.

VAN DUYSE (653) found a tumor as large as a pea attached to the posterior pole of an eye long blind from injury, which was enucleated for the relief of pain. The patient was a boy of twelve, and the tumor proved to be an endothelial alveolar sarcoma, wherefore exenteration of the orbit was done. The entire tumor, which had developed in the region of the posterior ciliary vessels without involving the optic nerve or sclera, was disc-shaped, 6–7 *mm* broad and 4–5 *mm* thick. It consisted of cells arranged concentrically about capillary vessels, of epithelial appearance, but varying in form and size. In other parts an alveolar structure existed, the groups of cells being separated by connective-tissue membranes so that carcinoma was suggested. This variety of microscopic structure, which is characteristic of endothelioma or angiosarcoma of the orbit, explains the different designations applied to these growths. v. MITTELSTÄDT.

In POST'S (655) case the piece of glass perforated the margin of the iris and lens, and projected from the latter into the vitreous. It was removed, after iridectomy, by a cataract scoop, along with a considerable portion of the lens. Two months later V = $\frac{20}{15}$, (patient aged seventeen). WERNER.

ALT'S (656) patient was a man of fifty-seven, who received a blow on the eye from a large piece of wood. There were dislocation of the lens and irido-dialysis noted at the time. Sometime subsequently glaucomatous symptoms supervened and the eye was enucleated. It was then found that the ciliary body had also been torn from its attachment by the blow. He considers the plugging up of Schlemm's canal the cause of the glaucomatous outbreak. BURNETT.

The points of interest about HANSELL'S (657) case of extraction of a bit of steel from the vitreous by a Hirschberg magnet are: 1, the length of time, six months, between the accident and the operation; 2, the retraction of the edges of the opening in the sclera to permit the easy exit of the foreign body; and 3, the recovery of vision to $\frac{20}{60}$. BURNETT.

XXI.—OCULAR AFFECTIONS IN GENERAL DISEASES.

658. DENTI. Acromegaly in its relations to the organ of vision. *Ann. di Ottalm.*, XXV., 6, p. 619.

659. LEHMANN. Hemianopsia in puerperal amaurosis. *Berl. klin. Wochenschr.*, No. 51, 1896.

660. SCHIRMER, TH. Subjective sensations of light with complete loss of visual power in the cortex of both occipital lobes. *Inaug. Dissert.*, Marburg, 1896.

661. JOFFRIO. The pathological changes in the retina from phosphorus poisoning. From the laboratory of Prof. Bellarminoff, abstract in *Medicina*, No. 27 and 28, 1896.

662. STRZEMINSKI. Hereditary syphilitic affections in the eyes of the second generation. *Rec. d'opht.*, 1896, No. 602.

663. VAN DEVENTER. A case of multiple sclerosis with blindness in both eyes. *Geneesk. Tydschrift voor Nederlandsch Indie*, XXXVI., p. 332.

664. HOFFMANN. On the simultaneous occurrence of optic-nerve and spinal-cord inflammations. XXI. *Wanderversammlung der südwestd. Neurologen u. Irrenärzte.*

665. WASKRESSENSKY. On the scorbutic affections of the eye. *Wojemo Med. Journ.*, 1896, No. 10.

666. BRÜNNICKE. On apoplectiform hemianopic blindness, with psychic blindness. *Hospitalstidende*, No. 51 and 52, Copenhagen, 1896.

667. BAILEY, PEARCE. The effect of early optic atrophy upon the course of locomotor ataxia. *Med. Record*, Nov. 14, 1896.

668. SHEFFIELD, H. B. A case of chorea minor involving also the ciliary muscle. *Amer. Medico-Surgical Bulletin*, Nov. 14, 1896.

669. AYRES, C. S. A case of chloroma. *Journ. Amer. Med. Assoc.*, No. 7, 1896.

670. FRIEDENWALD. Affections of the eye and normal menstruation. *Journ. of Eye, Ear, and Throat Diseases*, Oct., 1896.

DENTI (658) followed the eye symptoms in a case of acromegaly from their inception to the development of bilateral atrophy of the optic nerves. The gradual failure of vision, the contraction of the field, and the disturbances of circulation in the disc proved that there must have been pressure on the chiasm from the enlarged hypophysis cerebri, as has been found in other cases of this strange disease. DANTONE.

LEHMANN (659) reports a case, which, like the four cases described by Pick, confirms Graefe's view that uræmic amaurosis was due to an affection of the cortex. It was a case of hemianopsia in puerperal amaurosis, although the amaurosis was not due to uræmia, but was rather the form which is a symptom accompanying or preceding eclampsia. A woman in good health during her ninth pregnancy, except for some occipital headache. Labor normal. Twelve hours after, a left hemianopsia developed. Fundus normal. Small amount of albumen in the urine. The following day amaurosis, but two days later vision restored except in a small central field. Pupillary reaction and fundus normal. Four days later vision normal, and fourteen days later no albumen. The remarkable feature in this case was that, with eclamptic amaurosis, as the author terms it, convulsions and disturbances of consciousness were absent. Amaurosis from anæmia was excluded, as was also amaurosis from uræmia on account of the small quantity and short duration of albumen in the urine, while the tense pulse, the albuminuria, and the continued headache favored the idea of an eclamptic symptom, even if not a typical one.

SCHIRMER (660) records the case of a hard drinker of seventy-four who became suddenly blind after short prodromal symptoms. Ophthalmoscopic appearance normal. At the moment of blinding he seemed to see fire. There were found extensive destructive changes in the right occipital lobe, and a softening of

the entire left lingual lobule. The subjective visual perception at the moment of the affection was supposed to mean that the sudden excitation of the cerebral cortex by the circulatory disturbance produced a sensation of light which was projected outward.

Joffrio (661) found in his experiments that all cases of phosphorus poisoning could be divided into three groups:

1. Acute poisoning. The microscopic examination shows congestion of the retinal and choroidal vessels, slight infiltration of the ganglion-cell and nerve-fibre layers with mononuclear leucocytes, particularly near the posterior pole. Ophthalmoscopically, hyperæmia of the fundus.

2. Subchronic poisoning. The nerve-fibre and ganglion-cell layers are infiltrated with leucocytes. The rod-and-cone layer is in a state of degeneration, and at points is detached from the outer nuclear layer. The choroidal and retinal vessels are congested. Diapedesis from many retinal vessels. Some fibrinous exudation in the subretinal space. Ophthalmoscopically, marked hyperæmia of the fundus.

3. Chronic poisoning (the dogs having lived from thirteen to twenty-three days). Microscopically, marked infiltration of the nerve-fibre and ganglion-cell layers and the disc with mononuclear leucocytes; also some scattered leucocytes in the vitreous. The ganglion cells are much enlarged, and some are shrunken and contain small vacuoles. The entire rod-and-cone layer is detached and degenerated. The retinal epithelium is loosened at various points, and here the cells are enlarged and contain fat.

The disc is swollen; there are extravasations in the nerve-fibre layer; marked diapedesis; thickening of the arterial walls in the retina and iris. The choroidal vessels are so congested that the choroid resembles the corpus cavernosum. The limitans externa is separated from the outer nuclear layer, and forms an undulating surface. The ophthalmoscopic picture was the same as that in group 2. Hirschmann.

Strzeminski (662), in two children whose father had hereditary syphilis, found bilateral interstitial keratitis and small circumpapillary patches of chorio-retinitis with punctate opacities of the vitreous. He believed the affection to be hereditary syphilitic of the second generation and supports this diagnosis as follows.

1. The father had hereditary syphilis, having never acquired the disease, the mother is healthy.

2. The children suffer from an eye affection similar to that seen in patients of the first generation with hereditary syphilis.

3. All other etiological factors can be excluded.

4. The evident favorable influence of mercurial treatment indicated the syphilitic nature of the affection. SULZER.

HOFFMANN (664) reports two cases of blindness and paralysis of the legs. At the autopsy there was found a disseminate myelitis in the dorsal portion and a retro-bulbar optic neuritis. In the second case, that of a woman of sixty-five, there was transverse dorsal myelitis and marked optic neuritis. Cold, trauma, infectious diseases, gout, etc., are supposed to be etiological factors. The neuritis may appear before, with, or after the myelitis. The disease is a disseminate focal inflammation, and the term "encephalo-myelitis disseminata" is appropriate.

WASKRESSENSKY (665) gives the following characteristics of the scorbutic eye. At first the sclera is copper-red, and there are extravasations in the conjunctiva, particularly the bulbar portion, distinguished from ordinary extravasations by their dark red, almost brown color. The affection lasts for a month or six weeks, the cornea and vision remaining normal. At times the iris is affected, but the eye is not damaged. HIRSCHMANN.

BRÜNNICKE (666) records three cases of blindness having a hemianopic character following repeated apoplexies. In two of these cases psychic blindness existed and the power of orientation was lost. SCHIÖTZ.

As a result of the examination of a large number of histories and of twelve case which he reports in more or less detail, BAILEY (667) arrives at the conclusion that, in about 75 % of cases of tabes in which optic atrophy is an early symptom, some of the tabic symptoms may be late in appearing or may not develop at all. But the most distressing symptoms may develop simultaneously with or immediately succeed the blindness. No prognostic significance attaches to the association of the atrophy with oculo-motor paralyses. BURNETT.

The case that SHEFFIELD (668) reports has nothing to show in its history that the ciliary muscle was affected, as no record is given of the state of the accommodation. The title therefore is misleading. There was, however, an intermittent variation of the pupil in size from a pin's head to the fullest extent of dilatation several times a minute. The patient was a girl of ten years and was suffering from a pronounced chorea minor. On the cure of the chorea the eye symptoms disappeared. BURNETT.

AYRES (669) reports a case of double exophthalmus in a boy of seven years, due to tumors in the orbits. These tumors were of rapid growth, only two months elapsing between the time of first appearance and the death of the patient. There was marked leucocytosis, if not genuine leukæmia. A post-mortem examination showed the orbits to be filled with a greenish soft mass, which also invaded the cancellated tissue of the sphenoid and petrous bones. The tissue was homogenous and without septa. The substance of the tumor consisted of small round cells, none or very few spindle cells, and scant intercellular substance. There had been what was supposed to be a parotitis just previous to the attack, and the lymphatic glands were involved extensively. Deafness was also a pronounced symptom. Death occurred as a result of hemorrhage from the conjunctiva of the right eye.

BURNETT.

FRIEDENWALD (670) describes cases of eye trouble in connection with menstruation: among others, one similar to the keratitis punctata superficialis of Fuchs, and some of herpes corneæ; one case of recurrent conjunctivitis; one of iritis; and two of hemorrhage into the vitreous. BURNETT.

BOOK REVIEWS.

I.—**Sight**: an Exposition of the Principles of Monocular and Binocular Vision. By JOSEPH LE CONTE, LL.D. D. Appleton & Co., 1897.

All who are interested in the study of physiological optics will welcome this new edition of Professor Le Conte's book. There is perhaps no treatise of the same compass which gives so clear an account of the fundamental phenomena of monocular and binocular vision, and which is at the same time so suggestive and so original. Even those that are well grounded in the optical works of Donders and Helmholtz will gain by a thorough reading of this little book and by repeating for themselves the numerous original experiments that it contains.

The ophthalmologist will probably skip the first fifty-eight pages relating to the structure of the eye and to its refractive errors, but he will do well not to skip the next section on Space-Perception, including the explanation and proof of the laws of external projection and of direction, with numerous ingenious experiments, and remarks upon erect vision, the blind spot, etc. Section III. of this chapter is largely new, and gives a fair account of the theories of color-vision (including Mrs. Franklin's theory) and of the kind of sight possessed by the color-blind.

With Part II. (Binocular Vision) opens up the really original part of the work. The author's acute observations, and his clear presentation of the many intricate phases of this highly involved subject, are worthy of all praise. Particularly is this the case with his treatment of the question of binocular perspective (Chapters IV. and V.), in which he convincingly states what appears to us to be the true explanation of our notions of depth and solidity —an explanation opposed to some theories still more or less current.

Those who have read the previous edition will doubtless turn first to Part III., in which he treats of the laws of ocular motion and explains, in a way that to those used to the demonstrations of less perspicuous authors seems surprisingly simple, the laws governing wheel-rotation in parallel and convergent movements, and the horopter. In this edition he has seen no occasion to modify the views expressed in the first, in which he combated Helmholtz's ideas both as regards Listing's law and the horopter; returning, as far as Listing's law is concerned, to Donders's original explanation. To us, at least, his arguments seem irrefragable; and the more so because of the independent anatomical and clinical evidence supporting Donders's and opposing Helmholtz's statement of the facts.

Interesting chapters on Some Phenomena of Binocular Vision usually overlooked, Visual Phenomena in Ocular Divergence, the Comparative Physiology of Binocular Vision, and the Evolution of the Eye (in invertebrates and vertebrates) close the work.

A. D.

II.—**System of Diseases of the Eye.** Edited by WILLIAM F. NORRIS, A.M., M.D., and CHARLES A. OLIVER, A.M., M.D. Volume II., Examination of the Eye, School Hygiene, Statistics of Blindness, and Antiseptics. Pp. 556, octavo, with 13 full-page plates and 214 text illustrations. Philadelphia: J. B. Lippincott Company, 1897.

This second volume is, on the whole, quite up to the high standard of the first, already noticed in these pages, and is perhaps intrinsically more valuable than the first because many of its papers deal with matters of recent investigation which have not been so fully treated of in earlier text-books.

The papers on acuteness of vision, 11 pages, by Snellen; on mydriatics and myotics, 20 pages, by H. Snellen, Jr.; on lateral illumination, 16 pages, by Laqueur; on ophthalmoscopy, 26 pages, by Gould; on skiascopy, 22 pages, by Jackson; and on the balance of the extra-ocular muscles, 22 pages, by Stevens, are all clearly written, complete, and properly illustrated.

The paper on ophthalmometry, 30 pages, by Adolph Javal, Jr., is particularly good. It is systematically divided into sections, and the subject is treated adequately, yet in a simple and lucid manner. The author offers only such mathematical demonstrations as are necessary to explain the principles involved in measuring the surfaces of the cornea and lens; and the value of the

ophthalmometer and the importance of its findings are not proclaimed in the intemperate language to which we have been accustomed.

Prismometry is treated of by Dennett in a paper of 26 pages without a break or sub-title. The author appears to have taken a relatively unimportant subject very seriously, and his paper bristles with trigonometrical formulæ and tables. This, while well enough in its way, is hardly in keeping with the practical character of the volume, particularly since there is no reason why all that there is in the subject of value or interest to the ophthalmologist might not have been presented in a more comprehensible manner. It may be well enough for the author to say, without any readily discoverable connection with what has gone before or follows: "It is a well-known fact that if the radiant is in the denser medium the rays become the normals to an ellipse, but if it is in the rarer medium they become the normals to an hyperbola." Yet one might venture to assert that this will not be recognized as a well-known fact by 95 per cent. of the readers for whom this work is intended, nor will they be eager to have it told them.

Prisms may be designated, we are informed, by the refracting angle system, the angle of deviation system, the centrad system, the prism-diopter system, and the meter-angle system. Certainly no one will object to all these systems being described, but as three of them have not shown signs of surviving, it would seem superfluous to work out each table and formula for all five, as the author has done throughout.

Digressions into the discussion of problems which have interested the author as a mathematician and physicist, but which do not interest the ophthalmologist, and are, therefore, out of place in this paper, are only too frequent. On page 162 we meet with the following passage: "The resolution of the circular motion into its vertical and horizontal harmonic components enables us to show at a glance, or calculate with precision, just how much of the displacement caused by a prism in any position is corrected by the horizontal, and how much by the vertical, muscles. . . . What part is played by each of the four recti muscles in adjusting the right eye to a prism of 8^{d}, whose apex is, as placed in the trial frame, at 85° 30′, the degree marks on the frame being numbered counter-clockwise from the insertion of the internal rectus? Below is given the result of multiplying the cosine of the angular distance of the insertion of each muscle from the prism's apex

by the number of the prism." The part played by the superior rectus, for example, he finds to be 7.75^{d}. Now all this would be of no possible interest to the ophthalmologist, even if it was true; but the movements of the eye are not performed in any such simple way as the author indicates, and when the obliques are equally taken into account, as they should be, computations of this sort become manifestly impossible. What the author has really obtained is not the part played by each rectus in overcoming the effect of the prism, but merely the vertical and horizontal components of the rotation of the eyeball; which also is of no interest. Furthermore, the author's manner of expressing himself is involved. His style is not lucid. In fact he seems to delight in rendering his pages purposely obscure to a degree which makes them unintelligible to the ordinary reader. For what other reason, one may ask, could a self-evident statement be followed with an incomprehensible explanation, as in this sentence (still p. 162): "Thus, when the apex is vertical, the prism has no effect on the right internal rectus, because, as the apex is turned clockwise, the sine of the angle through which it has turned is the fractional part of the deviation which must be corrected by the internal rectus."

The longest and most important paper in the book is that on perimetry, 125 pages, by Wilbrand. It is a detailed and exhaustive account of the subject from the clinician's point of view, and is perhaps the best that has been written, even if it is not everywhere entirely up to date. The translator started out well, and much of the translation is excellently done, but he seems to have wearied of his work from time to time, and to have fallen into habits of carelessness which lead to no little obscurity and confusion. Descriptive terms are loosely applied, certain words are used where others were intended, and the diction in places is crude in the extreme. Considerable ambiguity is caused by using the expression "optic tract" to designate both the optic tract proper and also the entire course of the nerve fibres from the retina to the subcortical optic ganglia; by using "neurotic atrophy" for post-neuritic atrophy; and the like. Within the limits of a page can be found "arteria corpora callosi," "unilateral" where the author doubtless wrote "bilateral," and the following bit of careless writing: "Often the presence of an involvement of one or more of the nerves of the base of the brain is present." The presence is present, and "of" used five times in

a sentence of twenty-one words! showing that the translator is free from the morbid sensibility of Flaubert, "who," so Gautier said, "is tortured by a remorse that poisons his life: it is that of having heaped two genitives upon each other in *Madame Bovary*."

The papers on the detection of color-blindness, 38 pages, by Thompson and Weiland; on the causes and prevention of blindness, 44 pages, by I. Minis Hays; and on antisepsis, 26 pages, by Andrews, are all good. The paper on school hygiene, 66 pages, by Risley, is particularly timely, and will be welcomed by medical inspectors of schools, as being of great practical value; the illustrations, however, are very miscellaneous.

The concluding paper, 50 pages, by McFarland and Kneass, on the micro-organisms of the conjunctiva and lachrymal sac, comprises a description of some forty micro-organisms with about forty illustrations of cultures of non-pathogenic micro-organisms that have been found on the conjunctiva. Were not its presence explained by the authors, the reader might wonder at finding a paper here which would seem to be suitable only for a reference book of bacteriology. The authors' explanation appears in the following sentences: "It is, however, deplorable that so many ophthalmologists have hurried into the bacteriological study of cases with so incomplete a knowledge of the subject as to render their work not only valueless, but worse than that, an obstacle in the way of others." "The editors of this work conceived that one source of the bacteriological errors made by ophthalmologists depended upon the insufficient data with which they were furnished, and deemed it advisable to enter in their system this paper, which should comprise as complete a catalogue as possible of the bacteria which have been found upon the conjunctiva and in the lachrymal apparatus, etc."

The truly altruistic spirit in which this paper is conceived and its laudable purpose that hereafter the erring ophthalmologist shall have no excuse for doing bacteriological work that will be an obstacle in the way of others, will surely earn the gratitude of those who are in the habit of doing such work and for whose benefit the paper is intended; still, to ophthalmologists in general, we are not convinced that the greater part of this paper is of any particular interest, or that its value in a work on ophthalmology is at all commensurate to its length.

If our knowledge of the micro-organisms found on the conjunctiva was reasonably complete, a descriptive catalogue would

be useful for reference, and might properly have a place in a volume intended to be of more than transient value. But the list is growing from year to year, and the catalogue given here is not complete even at its time of publication. For example, there is no mention of the diplo-bacillus described independently by Morax and by Axenfeld as being found in the secretion of conjunctivitis, nor of a coccus found by Bach in similar secretion, nor of the well-known xerosis bacillus whose possible identity with the pseudo-diphtheria bacillus is now a matter of general discussion, nor even of actinomyces under its own name; yet some of these micro-organisms have been familiar to the ophthalmologist for years.

With the exception of a few points, such as those mentioned above, which seem to call for adverse criticism, the volume as a whole can be heartily commended; and the errors it contains are rarely errors of fact but rather, as it seems to us, errors of judgment in respect to the matter introduced aud the manner of its treatment. W. A. H.

Contents of the last three numbers of the Archiv für Augenheilkunde.

Vol. XXXIV., No. 3 (8 plates and 3 text-figures). Issued March, 1897.

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XIII. SALZMANN. The decrease in refraction caused by removing the lens.

XIV. SCHMIDT. On a case of papillo-retinitis with chlorosis.

XV. FRIDENBERG. On the pathology of hemorrhagic glaucoma.

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XIX. HEINERSDORFF. A case of bilateral non-inflammatory glaucoma in a young person with retinitis pigmentosa and myopia.

XX. The original articles of the English edition, Vol. XXV., Nos. 2 and 3. Abstracts by R. Greeff.

Vol. XXXIV., No. 4 (1 plate).

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Systematic report on the progress of ophthalmology during the fourth quarter of 1896. Translation in this number.

Vol. XXXV., No. 1 (2 plates and 2 text-figures). Issued July, 1897.

I. PERGENS. Buphthalmus with lenticonus posterior.

II. NEESE. A case of angioma orbitæ fibrosum.

III. WALTER. On accommodation in aphakia.

IV. GUILLERY. Conception and measurement of central acuteness of vision on a physiological basis.

V. GRUBER. Physical studies on ocular pressure and tension.

VI. KLINGELHÖFFER. The extirpation of an orbital cyst (cephalocele) by means of temporary resection of the orbital wall after Krönlein's method.

VII. BOCH. Continued experiments on disinfection of the lid margin and conjunctival sac. The effect of 0.75 % salt solution on the micrococcus pyogenes aureus.

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In the interest of our readers, who are scattered over the whole world—and whom, like ourselves, we desire to keep informed of all advances in ophthalmology,—furthermore in their own interest, authors of ophthalmological works are requested to send reprints, duplicates of journals, or copies for reviewing, to one of the above-named reporters, or to the editors or publishers of the Archives, according to their convenience.

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Under the heading of "Miscellaneous Notes," there will be published all kinds of professional news which specially concern the oculist, *e. g.*, appointments, honors, resignations, vacancies, new ophthalmic hospitals, opportunities for instruction, prize questions and essays, announcement of Society meetings, etc. Brief notices of this kind will be thankfully received by the editors.

Original papers of value from any source will, as heretofore, be welcome to the ARCHIVES, and are solicited.

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